APPENDIX TO THE REPORT OF THE MINISTER OF AGRICULTURE.

EXPERIMENTAL FARMS

REPORTS FROM THE

DIVISION OF BOTANY
DIVISION OF BEES
DIVISION OF FORAGE PLANTS
DIVISION OF POULTRY
DIVISION OF TOBACCO
DIVISION OF ILLUSTRATION STATIONS
DIVISION OF EXTENSION AND PUBLICITY

FOR THE YEAR ENDING MARCH 31, 1916.

PRINTED BY ORDER OF PARLIAMENT.

OTTAWA
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1917

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DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE
DOMINION EXPERIMENTAL FARMS

REPORT

FROM THE

DIVISION OF BOTANY

FOR THE

Fiscal Year Ending March 31, 1916

PREPARED BY

The Dominion Botanist. - - - - - - - - - - - - - - - - - - H. T. Güssow.

REPORT OF DIVISION OF BOTANY

H. T. GÜSSOW, DOMINION BOTANIST.

OTTAWA, March 31, 1916.

The Director,
Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith the seventh annual report of the work carried on by the staff of the Division of Botany.

The report gives detailed accounts only of such work as is held to be of most general interest to the public. Occasional inquiries, because of their more individual or local interest, are not mentioned, although they were numerous enough to occupy considerable thought and attention.

In the preparation of this report the Dominion Botanist was greatly assisted by the members of his staff, and credit is given to the services rendered by the individual members in the preparation of their respective contributions. I desire here to record my great appreciation of the faithful and invaluable services rendered by each of my colleagues. Without their co-operation much of the work accomplished during the year would have been very inconclusive.

As usual, the report is divided into several sections, viz.: I, Destructive Insect and Pest Act; II, Plant Pathology; III, Economic Botany; IV, Report from Field Laboratory at St. Catharines; V, Report from Field Laboratory at Charlottetown, P.E.I.; VI, Report from Field Laboratory at Fredericton, N.B.; VII, General.

I have the honour to be, sir,
Your obedient servant,

H. T. GÜSSOW,
Dominion Botanist.

I. DESTRUCTIVE INSECT AND PEST ACT ADMINISTRATION (PLANT DISEASE SECTION).

Potato Inspection.—The potato inspection inaugurated in New Brunswick in the fall of the previous year was continued until October 7, 1915. Shipments to Ontario and the western provinces were particularly heavy during the months of April and May, and the time of twenty-three inspectors was fully occupied in answering calls for inspection at the many loading places, chiefly at points along the St. John river, from Pokiok to Grand Falls, and along the Tobique river, from Perth to Plaster Rock. On account of the low prices prevailing earlier in the season, many farmers had refrained from selling their stock until April or May, with the hope that the market would improve, but this hope was not realized for at no time did the price exceed 45 cents per barrel for "table" potatoes; there was consequently a rush to meet all market demands at this time, even at the low price. Towards the end of May, as the shipping began to slacken, the staff of inspectors was reduced; there were, however, many calls for inspection during June and up to as late as July 12; in fact, a period of six weeks only intervened between the last inspection of the ship-

ments of the crop of 1914 and the first inspection of shipments of the 1915 crop. From July 12, the seven inspectors still remaining in the province were employed for several weeks in experimental work and field inspection of potatoes; two of them also attended several of the Provincial Agricultural Exhibitions with exhibits of plant diseases, and were able to give a good deal of information of an educative nature to those with problems along this line.

On August 27 the first inspection was made of shipments of the new crop, and from that date until October 7 a busy time was experienced in dealing with all the calls for inspection, chiefly due to the loading points being widely separated and the reduced inspection staff. However, by increased efforts on the part of every member of the staff, it was possible to cope with the situation.

This work was under the supervision of Mr. R. Holmden until July 8, when he was transferred to Prince Edward Island. On October 7 the regulations were cancelled.

The following figures show the number of cars and bushels inspected between April 1 and October 7, 1915:—

			Cars.	Bushels.
1914 crop	"first grade"	to Ontario	36	25,413
1914 "	"	Manitoba, Saskatchewan and Alberta	129	90,687
1914 "	"table"	Ontario	693	465,662
1915 "	"	"	394	231,714
	Total		1,252	813,476

On October 8 the inspectors were sent out to revisit the farms where field inspection had been carried on, for the purpose of inspecting the crops at harvest time. This work took considerable time as the farms were scattered over a great part of the province; where it was not possible for an inspector to be present at the harvest time, a thorough examination of the crops was made afterwards in the cellars. A part of this work was undertaken for the Canadian Seed Growers' Association.

During the late fall and winter, a number of farms have been visited for the purpose of ascertaining the quality and general condition of the crops in the cellars, and for giving information regarding any diseases present. In this connection, some 340 farms were visited, records being taken in each instance of the conditions found.

White pine blister rust in Canada.—Attention must be called to the outbreak of White Pine Blister Rust, which was unknown on the continent of America until recently. The disease has been most destructive in European countries, and every effort is necessary and is being made as far as possible to prevent this disease from establishing an alarming situation in Canada. I am indebted to Mr. Clyde Leavitt, Forester, of the Commission of Conservation for a memorandum of the commercial importance of the white pine in Canada, from which it may be gathered that any disease likely to prove destructive to this important forest tree must be considered from the aspect of the economic conditions and natural resources of the country:—

"In 1914, Quebec produced over 118 million feet of white pine lumber, comprising 10·6 per cent of the lumber cut of the province for that year. This lumber was valued at $2,641,281. In addition, nearly 175,000,000 feet of this species was shipped out of the province in the form of logs.

"Ontario, during the same year, produced 488,000,000 feet of white pine lumber, comprising 46·8 per cent of the total lumber cut of the province. The value of this lumber is placed at $10,158,751.

"In New Brunswick, the lumber cut of white pine during 1914 was 29,000,000 feet, valued at $586,649.

"For Nova Scotia, the cut was over 17,000,000 feet, valued at $277,657.

"The above figures represent returns from twelve hundred saw-mills in the four provinces named.

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"Thus we have, during 1914, in the provinces of Ontario, Quebec, New Brunswick, and Nova Scotia, a cut of more than 650,000,000 feet of white pine lumber, valued at upwards of $13,660,000, in addition to a very large quantity of white pine shipped out of the country in the form of sawlogs, with an additional value of upwards of $2,500,000.

"The cutting and manufacturing of this material furnishes employment to thousands of men, and supplies raw material for many hundreds of woodworking industries. In a publication by the Dominion Forestry Branch, no less than eighty-seven different classes of articles are shown as being manufactured from white pine in the province of Ontario.

"From the point of view of provincial government revenues, white pine is a very important factor. The forests on Crown lands in the provinces of Ontario, Quebec, and New Brunswick return a revenue direct to the provincial treasuries, amounting to a combined annual total not far from $4,000,000. These revenues go far toward the support of the Government, and mean a great decrease in direct taxation. Of this amount, it is probable that not far from $1,250,000 may be credited to white pine, taking into consideration the average receipts from bonus, ground rent and stumpage dues." (C.L.)

Prof. Wm. Sommerville, D. Oec., a British authority, writing on conditions of this rust in Great Britain, states: "This disease is so much on the increase that it is not too much to say that the outlook in this country for the white pine is almost hopeless. If it spreads in North America, as it has done in Europe, the loss that will result through the destruction of one of America's most valuable lumber trees can only be described as appalling."

The Forestry Branch of the province of Quebec must be congratulated on having vigorously taken up the work of control, and on producing a most instructive circular containing a coloured plate of this disease, which we understand is widely distributed throughout Ontario. The attention of all lumbermen, foresters, and others interested in the preservation of this valuable forest tree is directed to this danger. It is hoped that one and all will co-operate in the effort made to defeat one of Canada's most important foes to her white pine resources.

Mr. W. A. McCubbin, M.A., assistant in charge of the field laboratory at St. Catharines, is in a position, from the work done under his direction, to report on the present status of White Pine Blister Rust in Ontario, and his account, together with a number of instructive photographs, will be found of interest:—

"Among the latest nuisances that have been imported here from other lands is one that hails from Europe, where it has been a well-known pest for many years. It is the White Pine Blister Rust, *Peridermium Strobi* Kleb. As the common name indicates, it is chiefly noted as a fungus parasite of the White Pine, *Pinus Strobus* L., but it can also attack several other species of pines, viz.: *P. cembra, P. monticola, P. excelsa,* and *P. Lambertiana,* and perhaps any or all of the other thirteen species of five-leaved pines. It may be noted in passing that the five-leaved pines alone are susceptible, and that the two- or three-leaved species, including the Austrian pine, the Scotch pine, and the jack pine of our northern forests are not subject to the disease.

"The most serious phase of the blister rust on the white pine occurs in the seedling stage. It is believed that the fungus gains entry by some wound in the twig or branches and from there it grows up and down and around the branch in the soft bark. In a short time the limb or stem is girdled, and the part above the affected area dies. The presence of the fungus in the tissues causes a considerable swelling of the limb, and this swelling often takes on a sickly, yellowish appearance. Once established, the fungus progresses down the branch or stem year by year. Each spring there arise, from the swollen discoloured tissue invaded during the previous year, numerous pale orange or whitish blisters, filled with countless spores. It may take branch infec-

tions on a large tree a long time to kill the tree, but on the other hand seedlings are killed very quickly, and as seedling trees are more susceptible to attack, it may be seen that in or near the affected grove, the seedlings, on which future forests depend, would have little chance of surviving.

"Like many other rusts, this fungus passes part of its life on another host—the currant—or, to speak more correctly, on all species of the genus *Ribes*. Of these species which include all the wild and cultivated currants and gooseberries, the common garden black currant is by far the most susceptible. On the red and white varieties, on gooseberries, and on wild currants, comparatively little damage is done, but black currants suffer so severely at times that the disease promises to become quite a serious pest in black currant plantations.

"The spores shed by the blisters on the pine (Plate LIII*c*) in the spring are not known to be capable of infecting other pines again, but they readily infect near-by currants. The leaves only of the currant plant are attacked, and ten to fifteen days after infection there appear on the under sides of these leaves small pustules of a brilliant orange colour, and filled with orange spores. (Plate LIV.) These spores in their turn are carried by the wind to other currant leaves, and thus the currant infection is spread throughout the summer. So rapid is the spread of the disease by means of these spores that where black currant plantations are numerous in a district all the fields for several miles around may be rusted before the end of the summer. Although the spores produced in the early part of the summer on currant leaves are incapable of infecting pines, yet towards the close of the season the pustules put out small peg-like growths on which spores are formed which are able to infect pines again; and since, as noted above, the rust may spread on currants for several miles, there is every danger that a new lot of pines may be infected a long distance away from the original pine from which the currants received their infection in the spring.

"This stage of the rust on the currant has usually been considered of minor importance as a currant disease. Perhaps where currants are few and distant from each other little damage may be caused; but in the Niagara district where there are numerous large currant plantations close to each other, the disease has been so plentiful in the last two years that it promises to become a serious pest. In many cases the black currants were completely defoliated long before the end of the summer, and in the warm weather of early fall the winter buds on these canes started into growth. The second set of leaves thus produced, (Plate LV*b*), were usually rusted in their turn, and all of course perish in the first autumn frosts. Since this secondary foliage destroys the winter buds and uses up a considerable amount of the food stored for spring growth, the effect on the general vigour of the plant is disastrous.

"So far as we yet know, the rust on the currants dies out in winter and infection has to start again each spring from some blister canker on a nearby pine.

"We have here then a disease, the life-history of which may be summed up as follows—

"(A). On the Pine.—

"1. Attacks only five-needled pines, on which it lives perennially in the bark of the limbs and stem.

"2. It produces cankered areas with discoloured swellings. (Plate LIII*a* and *b*.)

"3. Limbs or stems are girdled and killed; seedlings are killed rapidly, adult trees more slowly.

"4. Spores produced in early spring from canker blisters may infect nearby currants, but not pines again. (Plate LII*c*.)

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"(B). On currants.—

"1. On all wild and cultivated currants and gooseberries; black currants particularly susceptible.

"2. Leaves only affected; small orange-coloured pustules on the under sides. (Plate LIV.)

"3. Spores from these pustules spread the rust in summer to other currants, but not to pines.

"4. In fall or late summer spores capable of infecting pines are formed.

"5. The rust probably dies out each winter on the currants, and has to be started in the spring from pines again.

"It is well established that the Blister Rust was brought to this continent from Germany, Holland, and France, on white pine seedlings imported for nursery purposes. Both in the United States and Canada numerous infections in different districts have been definitely traced to some seedling pines affected by the disease, and either standing in the nursery row or planted out in shrubberies or forestry plots. In only one case in Ontario has the disease been found on native white pines, and as these trees were standing close to two nurseries, it can hardly be doubted that imported nursery trees were the original source of the disease.

"The work carried out by this laboratory during the past year included such surveys and experiments as would help to establish a basis for the extensive control measures which it was felt would surely be necessary in the future.

"An attempt was made to locate the actual areas in Ontario already occupied by the disease. This work was carried out in conjunction with Prof. J E. Howitt, of the Ontario Agricultural College, and in the accompanying map all the infections known to be present in 1915 are recorded.

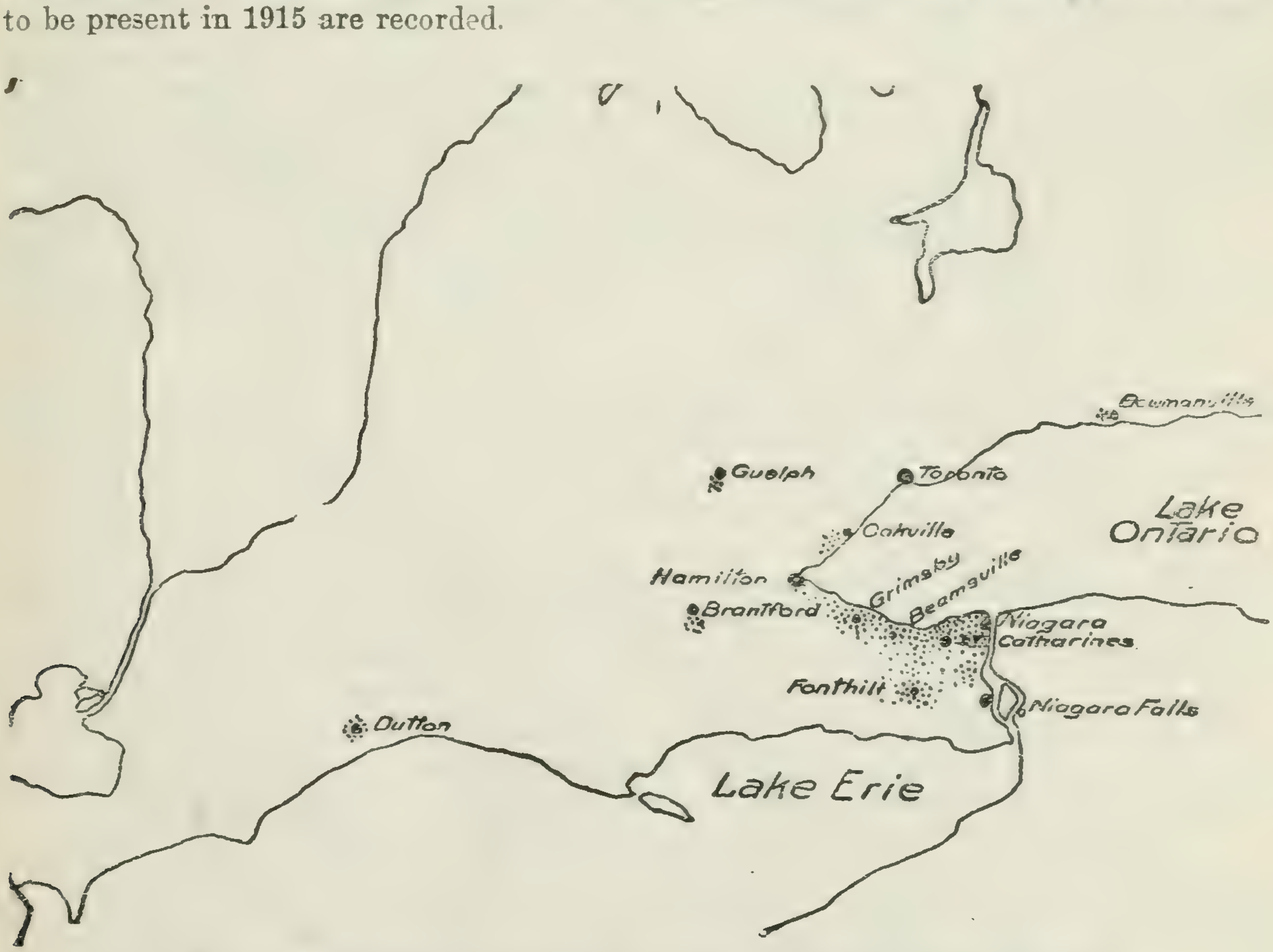


Fig. 1. Map showing the distribution of the Currant Rust in Ontario in 1915.

"In addition, special attention was given to the main outbreak in the Niagara peninsula, and efforts were made to locate as many sources of infection as possible, by inspections of nursery pines, pine plantations, and woodlots. Eight nurseries were thus inspected. Of these only three contained five-leaved pines, and in only one of these was the *Peridermium* found. It was present here on three imported seedlings. Seven lots of imported pines which had been planted out in various places as ornamental trees were all found to be free from the disease. Over 900 native pines in eleven different woodlots were also examined as carefully as possible. In this case no effort was made to inspect trees older than 12 or 15 years of age, since it was found impossible to locate the disease in the taller trees with any certainty. In the eleven woodlots mentioned only one showed any sign of the disease, and here there occurred over 200 cases of the Blister Rust, on branches and on the stems of young trees. These were not all found at one time, but were located in the several visits made during the summer. As soon as they were found they were cut out or the tree destroyed, but in succeeding visits more cases could always be located. The difficulty that was here met with in locating all the infected limbs indicates that any inspection work of this nature will have to be conducted with extreme care in order to be successful.

"From this woodlot as well as from the affected nursery mentioned, both of which were at Fonthill, the disease was seen to have started on nearby black currants on June 3, and from this centre the currant rust spread in an ever widening circle all through the summer. Outside of this well defined area of infection no rust appeared in the rest of the peninsula east of Beamsville until long after this date. In the region lying below the escarpment between Beamsville and Niagara-on-the-Lake, surveys made up to July 6 disclosed no sign of rust on currants. At this date the Fonthill epidemic had spread approximately two miles from the original source, and the hope began to arise that the Fonthill pines were perhaps the only source of the disease in the whole of this end of the peninsula. On August 9, however, in another survey of the district between St. Catharines and Niagara-on-the-Lake, rust was found on every field between these points, and a similar survey to the west of St. Catharines, made on August 10, showed that the currants were rusted to a slight extent in that direction for some five miles, though the Jordan, Vineland, and Beamsville districts were free. Since, at this time, the infected area at Fonthill was separated from this lake district by a zone of disease-free currants several miles in width, it seems natural to conclude that one or more sources of infection were present in the lake shore region, though no affected pines could be located there.

"From this time on the rust advanced into fresh territory, until at the end of the summer it had reached Beamsville, where it joined with a similar large area of infection, the source of which was apparently at Grimsby. A similar spread took place in the Fonthill area, which by fall had occupied the large territory shown in the map.

"During the progress of this survey work an effort was made to find out how far the spores of the rust may pass from one currant field to another, a very important point in connection with the spread of the disease. In some of the outlying townships where the currant fields are few and there is little or no bush where wild currants or pines might be a possible source of infection, it was established that leaps from field to field of at least half a mile may occur. In this connection it may be noted that, according to the observed rate of spread of the disease in an infected area, and allowing for a two-weeks' incubation period, the actual distance to which the spores may be transported would be much greater than this, as much as two miles perhaps.

"Another point of importance in the disease is the question of how long the acidiospores from the pine blisters will retain their power to infect the currant. In order to obtain some answer to this question, a young pine tree with the blister stage well developed was brought in from the affected wood lot on May 6, and kept in a box where it was allowed to dry out. Infections on currant leaves were made from the spores from the blisters on May 7, May 21, June 4 and June 23. In each case the spores

were mixed with water and applied to the under sides of the leaves with a camel's hair brush. The leaves were then enclosed in bottles to keep them moist. Only the first three infections were effective. The last series on June 23 produced no rust, although the precaution had been taken of infecting leaves of three ages. On the successfully infected leaves the rust pustules appeared after ten to twelve days, and in twelve to fifteen days spores were produced.

"While these experiments were too few in number to establish the life-limit of the spores with accuracy, yet they indicate clearly that spores from the pine blisters will retain their infective power for a month at least. It also appears that the period of incubation, or the length of time from infection until spores are formed again, is about two weeks. This result closely agrees with the records of other experiments on the same point.

"A very important phase of the Blister Rust question is whether the fungus will winter over on the currant, or whether each year's currant infection has to be started from some infected pine in the spring. Attempts have already been made to settle this point, and the results seem to indicate that no wintering on the currant takes place. It was thought advisable, however, to make some further trials along this line with reference to our own conditions. Accordingly, there were secured from a local nursery 100 two-year-old black currant plants (Boskop Giant), from a stock that had been very badly rusted in 1914, and these were planted out in five lots in a region that was known from personal observation to have been free from rust the preceding season. These plants were taken up from the nursery rows on April 18 and shipped to the northern end of Peel county, where they were planted out about April 20. Although this district was primarily chosen because of its freedom from rust, it was also suitable for the purpose on account of the scarcity of pines in the neighbourhood, as well as for the fewness of its currants; so that should any rust develop on the experimental plots, the danger of starting an epidemic would be reduced to a minimum. In each case the owner was given a specimen of the rusted currant leaves mounted under glass, for comparison, and requested to keep a careful watch for any sign of the disease.

"The treatment accorded to each of the lots was as follows:—

Lot 1.—Twenty-five plants; fumigated but unsprayed.
Lot 2.—Twenty-five plants; fumigated but unsprayed.
Lot 3.—Twenty plants; fumigated and sprayed with soluble sulphur before removal from the nursery rows.
Lot 4. Twenty plants; fumigated and sprayed as in lot 3.
Lot 5.—Ten plants; fumigated, and sprayed as in lot 3; in addition badly rusted currant leaves which had been kept out of doors in a basket over winter, were suspended in wire cages amongst the foliage of these plants, in order to give an opportunity for infection from this source.

"Besides relying on the watchfulness of the owners to determine the first occurrence of any rust spots on the leaves, a thorough examination was made of all of them on May 24, at which time no sign of the rust could be seen. It was thought that any infection from over-wintered spores would be quite evident at this time, so no further examinations were made during the summer except in the case of lot 5, which was inspected again on August 27, and found to be still free from rust.

"A final round of inspection on October 18 showed that all these plants were still entirely free from rust infections, with one exception: a few leaves on one plant in lot 3 were found to be affected by the disease.

"At first sight it would appear that there is here authentic proof that the rust is self-infecting on the currant, *i.e.*, that it will perpetuate itself from year to year without having to be started each spring from an affected pine. This point is of such extreme importance from the practical side, however, and the proof rests so entirely

on one single case obtained from a rather restricted set of experiments, that it would be unfair to draw the above conclusion without a careful study of all the circumstances.

"When found on October 18, the infection was still very restricted, involving only one plant—perhaps a dozen leaves. It was plainly of the two-cycle type, *i.e.*, there was a small original rust spot, now of considerable age, and a number of recent pustules, all of equal age and which had evidently been started by spores from the older spot. The leaf on which the original spot occurred was two-thirds of the way up a shoot of the present year's growth. All the other pustules were on leaves adjacent to this one. All the spots were at this time producing the teleuto-stage, and the parent spot showed in its tendrils the whitish furry coat characteristic of the presence of sporidia, but the secondary spots had not yet reached this stage.

"There are, I take it, three ways in which infection could have taken place in this case:—

1. Locally, from some nearby pine or currant.
2. Self-infection, either by means of adherent spores, or from hibernating mycelium.
3. Accidental infection of some kind.

"Concerning the possibility of infection from any local source, the writer is perfectly convinced that it could not have taken place. All of the very few currants within the radius of a mile have been carefully examined and no trace of the rust found. There are several old native white pines in a lane a little less than half a mile away, and no others within a radius of a mile and a half. The region is very hilly, wooded and sparsely settled, and so little attention is paid to the growing of small fruits that few if any nursery currants have been planted in the neighbourhood in recent years.

"The possibilities are, therefore, reduced to either self-infection or to accidental infection of some sort. With regard to the latter, the various chances by which spores could have been transferred from the nearest affected area, 60 miles away, were considered. The remote chances of infection being brought in basketed fruit, nursery stock, or in the clothing of visitors from a rusted district, could all be readily disposed of by the testimony of the owner. There are practically two other possibilities left; migrations of birds, and the inspection visit of May 24. Although no currant pustules had been met with before that date, some inoculations had been made in the laboratory from pine blisters on May 21, three days before, and it is conceivable that some of the spores had been carried in the clothing of the writer to this field at the time of inspection.

"Vague as these possibilities may be, yet they cast such doubt on the otherwise clear case of over-wintering that there can remain but a suspicion that the fungus may live on the currant itself and start a new infection during the second season.

"The method of fighting the disease which has been used heretofore consists of a careful survey to locate the infected pine or pines, and the immediate destruction of these when found. In isolated areas where either pines or currants are few, this method can be relied upon to give satisfactory results, especially where it can be continued year after year without much danger of the spread of the disease because of the scarcity of either host. Judging from the experience of the United States Forest Service in stamping out a number of infected areas in that country, we may not find exceptional difficulty in eradicating the Blister Rust from the isolated districts in the province. But in the case of the main region affected, which contains over 300 square miles of territory, the problem promises to be extremely hard to solve. Not only are there thousands of currant plantations, large and small, throughout the Niagara Peninsula, thus permitting the rust when once started to sweep over miles of country, but there are as well immense numbers of half-grown and seedling pines scattered about

the whole section, all exposed during the summer to wholesale infection. It would be almost miraculous if there are not now established thousands of pine infections, each capable of starting an epidemic of currant rust.

"Any adequate inspection of the pines in this district would be a stupendous task, and even with the utmost care in this work the location of more than 90 per cent of the blister cankers would be a virtual impossibility. If currants were scarce and far from each other perhaps the disease would be reduced in successive years and finally eliminated, but the presence of so many currants in close proximity makes it possible for the 10 per cent of cankers remaining to start practically as much rust as if the whole lot were left, and in this way the pine infections will each year be plentifully renewed.

"Spraying currants has suggested itself as a means of dealing with the disease. This phase of the subject has been given some attention during the recent summer. Two black currant plantations in the affected district have been sprayed at intervals of two weeks throughout the summer, one with Bordeaux mixture and one with soluble sulphur. It was realized that the spray would have to be applied to the under sides of the leaves to be effective, and though this was done as thoroughly as possible in our work, it must be admitted that it takes so much time and care that satisfactory spraying of this kind would be out of the question in a commercial way. Owing to frequent rains during the summer the best results were not obtained from this work, but even allowing for this it was certain that, though the amount of the rust can be greatly reduced by spraying, it cannot be controlled sufficiently to prevent the spread of infection. (Plate LV*c*.) Consequently, whatever value spraying methods may have as a means of protecting individual plantations, they are likely to be of little use in combatting the disease as a national pest. In this connection it has been suggested by the Dominion Botanist that since spraying will not completely control the rust, it may work a positive harm by keeping the infected leaves longer on the bushes in the fall, and thus materially extending the period during which infection of the pine may take place, providing, of course, that the infection of pines is possible throughout the whole season.

"There is still another cause for alarm in the present situation. Millions of fruit packages are sent out from the Niagara fruit district each year, and great numbers of these undoubtedly carry with them to other parts of the province the spores of the rust. It can not yet be definitely stated how long these spores retain their power of infection, but if it is even so short as a few days, there is a constant danger of the disease being spread into other parts of the province by this means. For this reason a yearly inspection of the whole province will probably be found necessary until danger from this source has been eliminated.

"On account of the stringent regulations in force regarding the importation of European-grown pines, there is little likelihood of further introductions of the disease, so that, if it can be eradicated from the areas now infested, our white pine forests, which are still of untold value to the nation, may yet be saved from its ravages."

II. PLANT PATHOLOGY.

From the records of the weather it would appear that the belief that rainy seasons are responsible for much damage to crops from diseases, was fully confirmed.

It was a most unusually favourable season for "Late Blight" in potatoes and the damage done was considerable and universal in the eastern parts of the country. In regions where Late Blight does not usually cause heavy losses, they were considerable; and in certain localities where potato spraying is still regarded with indifference, or where the belief exists that no profits are to be made from spraying, the losses amounted to almost 50 per cent of the possible crop.

If the spraying of potatoes is really a protection for the potato crop, it would be best demonstrated during seasons like the one just past where the disease was widely

prevalent. The field stations situated at Charlottetown and Fredericton, therefore, undertook spraying experiments on a number of privately owned farms, with the result that an acre of sprayed potatoes yielded on the average in New Brunswick and Prince Edward Island some 100 bushels more than an acre of unsprayed potatoes.

To give one striking example of the ravages of Late Blight will suffice, though many more may be quoted. An inspection was made by the Dominion Botanist and others interested, of a potato field just when the potatoes were being harvested. The disease had gone into the tubers, and 28 per cent of the total tubers harvested were useless for anything but immediate stock food. This farmer would have scarcely succeeded in keeping any quantity of this crop over winter, as storage rots would have surely destroyed many bushels, if not all. It is most unfortunate that all farmers do not provide for suitable storage. The conditions prevailing in most cellars are very unsatisfactory; they are too warm and too moist, with almost no ventilation. Potatoes require a cool storage place, where the temperature does not rise above 38° F. at the most. Naturally, the cellar must be frost-proof.

In Ontario, in the early part of the season, there was quite a promising crop, but owing to the wet weather this promise was not fulfilled. The heavy rainfall retarded growth and caused a wet rot of the stalks, and many plants died. Many fields could be observed with water standing between the rows and the tubers rotting in the ground (Plate LVI).

New Ontario promises an excellent region for potatoes. As an example may be cited a field near Earlton, where a single hill selected at random produced twenty-nine tubers of table size.

Ontario is fortunate in being reasonably free from serious potato diseases. Common Scab is the worst trouble, but there are few diseases of general economic importance. Leaf Roll, Curly Dwarf, Mosaic, are exceedingly scarce, and it is hoped that the Ontario farmers will exercise great care in keeping their crops free from diseases. It would be well to adopt the methods outlined in the Division's Circular No. 9, entitled "the Control of Potato Diseases."

Powdery Scab Experiments during 1915.—The experiments were placed in charge of Mr. F. L. Drayton, Assistant Plant Pathologist, under my direction. Mr. Drayton deserves much credit for his attention to this phase of work.

At the request of the Dominion Botanist, Mr. P. A. Murphy, Assistant in charge of the Prince Edward Island laboratory, critically collated the results obtained.

The following experiment on the treatment of "seed" potatoes for the prevention of Powdery Scab was carried out at the Central Experimental Farm, Ottawa, and at the Experimental Stations at Charlottetown, P.E.I., Fredericton, N.B., Kentville, N.S., and Ste. Anne de la Pocatière, Que. The experiment was on the same scale (except at Ottawa), and similarly conducted, at all places. The "seed" used was naturally infected and as nearly uniform as could be procured, but it was not all of the same variety at the same Station. One of the difficulties of this experiment is to obtain sufficient "seed" of one variety which is all equally infected. The soil was in all cases virgin.

Each plot consisted of a single row thirty inches wide planted with sixty sets (except in the case of Ottawa where the number varied from sixty four to one hundred and ninety-two), placed twenty inches apart. The sets consisted of whole tubers. There were nine plots, the "seed" for each being treated differently, as follows:

TABLE I.—Showing the treatment given the "seed" for the different plots.

Plot.	Substance or treament used.	Strength or manner of use.	Length of treatment.
1	Corrosive sublimate	1:1000	1½ hours.
2	" "	1:2000	3 "
3	" "	1:3200	Over night.
4	Formalin	1:300	3 hours.
5	"	1:600	3 "
6	Flowers of sulphur	Damp tubers rolled in it.	
7	Copper sulphate	1:170	3 "
8	Tubers kept in warm room before planting		22 days.
9	No treatment. Check		

The percentage of tubers by number affected with Powdery Scab at each of the five places where the experiment was carried out is shown in the next table.

TABLE II.—Showing the percentage of tubers by number affected with Powdery Scab in the different experiments.

Plot.	Percentage of tubers by number affected with Powdery Scab.					
	Ottawa.	Charlotte-town.	Fredericton.	Kentville.	Ste. Anne de la Pocatière.	Average of all experiments.
1	0·0	0·0	2·1	5·9	7·0	3·0
2	0·0	0·0	1·4	11·0	8·1	4·1
3	0·0	0·0	2·7	6·4	10·6	3·9
4	0·0	2·1	2·7	11·2	11·3	5·5
5	0·0	2·3	1·0	6·7	13·2	4·6
6	1·8	2·5	1·9	8·3	17·9	6·5
7	0·6	2·3	1·8	9·7	6·7	4·2
8	37·9	4·5	9·6	53·5	66·0	34·3
9	8·3	1·6	10·2	12·9	41·2	14·8

If we examine the average of all the experiments, first, the outstanding fact is, that keeping the seed potatoes in a warm room for twenty-two days more than doubled the amount of scab, increasing it from 14·8 per cent to 34·3 per cent. This result was constant at all Stations except Fredericton.

Of the disinfectants, corrosive sublimate proved itself the best, closely followed by formalin. While corrosive sublimate in the three strengths used was entirely effective in preventing the disease at Ottawa and Charlottetown it was not so at the other three Stations. There is little to choose between the three strengths, although the concentration of 1:1000 is slightly the best. The results on plot three, in which the seed was treated with corrosive sublimate 1 part to 3,200 parts of water over night, prove that this disinfectant is effective in much lower concentrations than that in which it is usually employed. Experiments previously carried out by the Division of Botany have shown that it is quite as effective in the proportion of 1 to 2,000 parts of water as in the strength of 1 to 1,000 if the time of application be increased to three hours, and these results are substantially borne out here.

At one Farm only, Ottawa, did formalin prove entirely effective, while at the others it reduced the amount of disease on the average from 14·8 per cent to 5·5 per cent in

the case of formalin of strength 1:300, and to 4·6 per cent when the 1:600 strength was used. In two of the experiments the former gave better results, and in two the latter, so that it is likely that the difference does not exceed the experimental error; in which case it may be assumed, provisionally at least, that concentrations greater than 1:600 will not be justified by the results.

Flowers of sulphur and copper sulphate were the other disinfectants tried. The former had a tendency to interfere with the sprouting of the sets and to cause misses, while at the same time it proved the least effective germicide. The effect of the copper sulphate treatment in causing misses was much more marked and the hills which were produced had an average of 2·4 tubers less in them than the average of the other rows. As a preventive of Powdery Scab, copper sulphate ranks somewhat better than formalin and not so good as corrosive sublimate, but its deleterious action on the sets renders its use as a potato disinfectant impracticable.

Turning to plot eight, the seed for which was kept in a warm room for twenty-two days before planting, we are confronted with the fact already mentioned, that this method of storing more than doubled the amount of disease on the average, the increase being very marked at every Station except Fredericton, where it was slightly less than on the check plot. It is not easy to offer an explanation of this phenomenon without further experiments. A tentative reason may, however, be put forward, namely, that the temperature was a favourable one for spore germination, thus increasing the amount of actual infecting material as well as the time in which it had to act. In the other plots it would take some time after planting for the spores to germinate, and it is possible that fewer of them would do so than if they had been previously stimulated thereto by being kept some time at a warm temperature. It may also be that the tuber must be attacked at a particular stage of its development, possibly an early one, which would help to bear out the above hypothesis. This, also, would prove one of the two most obvious explanations of the recently reported failure of Kunkel[1] to infect potato tubers with cultures of (presumably) *Spongospora subterranea*. The supposition is easily credible when we consider that in most cases an affected tuber is able to isolate the invader in a small area, the scab spot, by means of a ring of cork, indicating that the parasite is, as a rule, unable to penetrate such tissue. This may also hold in the case of roots, which, at least in the Charlottetown experiment, were attacked by the fungus, as Pethybridge[2] described some years ago in Ireland, with the production of galls. Melhus and Rosenbaum[3], in making the first recorded discovery of this in America, were apparently ignorant of the fact that it had been known in Europe for several years.

The theory is also strengthened by previous experiments carried out by the Division of Botany. It has been found to be very difficult to transmit the disease to new tubers on clean soil through the agency of infected tubers kept over winter in a living room. A likely explanation of this is that the spores germinated, and, not finding a favourable medium for their development, apparently, died, or were at all events unable to cause infection in the spring. The *amœba* (accepting the most recent work of Kunkel[4] on this point) produced on the germination of a spore may under such circumstances encyst and so tide over for some time at least an unfavourable period, but that it can do so an indefinite number of times, as Kunkel[5] holds, and still retain its vitality is open to serious doubt. In this, as in several other questions, there is urgent need for someone to clear up the discrepancies which exist in the accounts

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[1] A contribution to the life history of *Spongospora subterranea*. Jour. Agr. Research. 4. 1915, pp. 265-278.

[2] Investigations on Potato Diseases. Jour. Department of Agriculture and Technical Instr. of Ireland.

[3] *Spongospora* on the roots of the potato and on seven other new hosts. Phytopath, 6, 1916, p. 108.

[4] l. c.

[5] l. c., p. 275.

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given by Johnson,[1] Massee,[2] Horne,[3] Osborne[4] and Kunkel.[5] This view seems to be at variance in another way also with the results of the last-named author who would probably hold that a potato in storage is a favourable medium for the parasite to thrive on since he finds that it feeds on the cells surrounding the scab spot. On the other hand, the views are in some agreement because Kunkel finds that the spore may germinate to some extent in storage, a process which could, presumably, be hastened by more favourable temperatures, as the présent author suggests.

It will be noticed that there is extreme divergence at the different stations in the amounts of disease which occurred. This cannot be explained by the "seed" which was as uniform as could be procured; nor can it be a climatic factor because the amount of the disease present in a province and that showing in the experiment conducted in that province are by no means in direct proportion. There are no grounds whatever for believing that the ground was infected in any case. At Ottawa and Charlottetown, where the disease was least, the potatoes were grown on wet, low-lying soil, one being clay and the other "muck" or peat. A good many of the sets missed for this reason, particularly at Ottawa. In the Charlottetown experiment, it was particularly noticeable that twenty-nine of the thirty-one plants which produced diseased tubers were at the extreme upper and drier ends of the rows. The physical condition of the soil during the growing season appears to have been more nearly normal at the other Stations. From this it seems to follow that wet soil and a low percentage of disease are associated, a result which is in direct opposition to the generally accepted view that the parasite is more harmful on wet than on dry land, which view is, however, based on no experimental evidence. It is intended to inquire into the matter further.

It was the experience in practically all the experiments that the plants in row eight (the "seed" for which was kept in a warm room for twenty-two days before planting) developed more quickly than the others. This might be explained by the sprouting of the tubers while they were in the warm room. However, the maturing was not only early but premature. The plants did not reach full size and the same was found to be true of the tubers when they were dug. It was further found that while the size of the tubers had decreased the number had increased, in fact in all the plots the number of tubers was about in proportion to the virulence of the disease with the exception of those in which sets treated with flower of sulphur and copper sulphate had been planted. In these the injurious action of the chemicals on the sets introduced a second variable factor. So far as the author is aware there is no previous record of Powdery Scab as exerting an influence on the plant in reducing its vigour and yield, nor of increasing the number of tubers at the expense of their size. The following table shows the average number of tubers per hill together with the average number of diseased tubers in the five experiments.

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[1] Some injurious fungi found in Ireland. Econ. Proc. R. Dublin Soc., I, 1907, pp. 345-370. *Spongospora Solani* Brunch. (Corky Scab.) Ibid. I, 1908, pp. 453-464.
[2] Diseases of cultivated plants and trees. London, 1910.
[3] A preliminary note on *Spongospora Solani* Brunch, Ann. Bot. 25, 1911, p. 272.
[4] *Spongospora subterranea* (Wallr.) Johnson. Ann. Bot., 25, 1911, pp. 327-341.
[5] l. c.

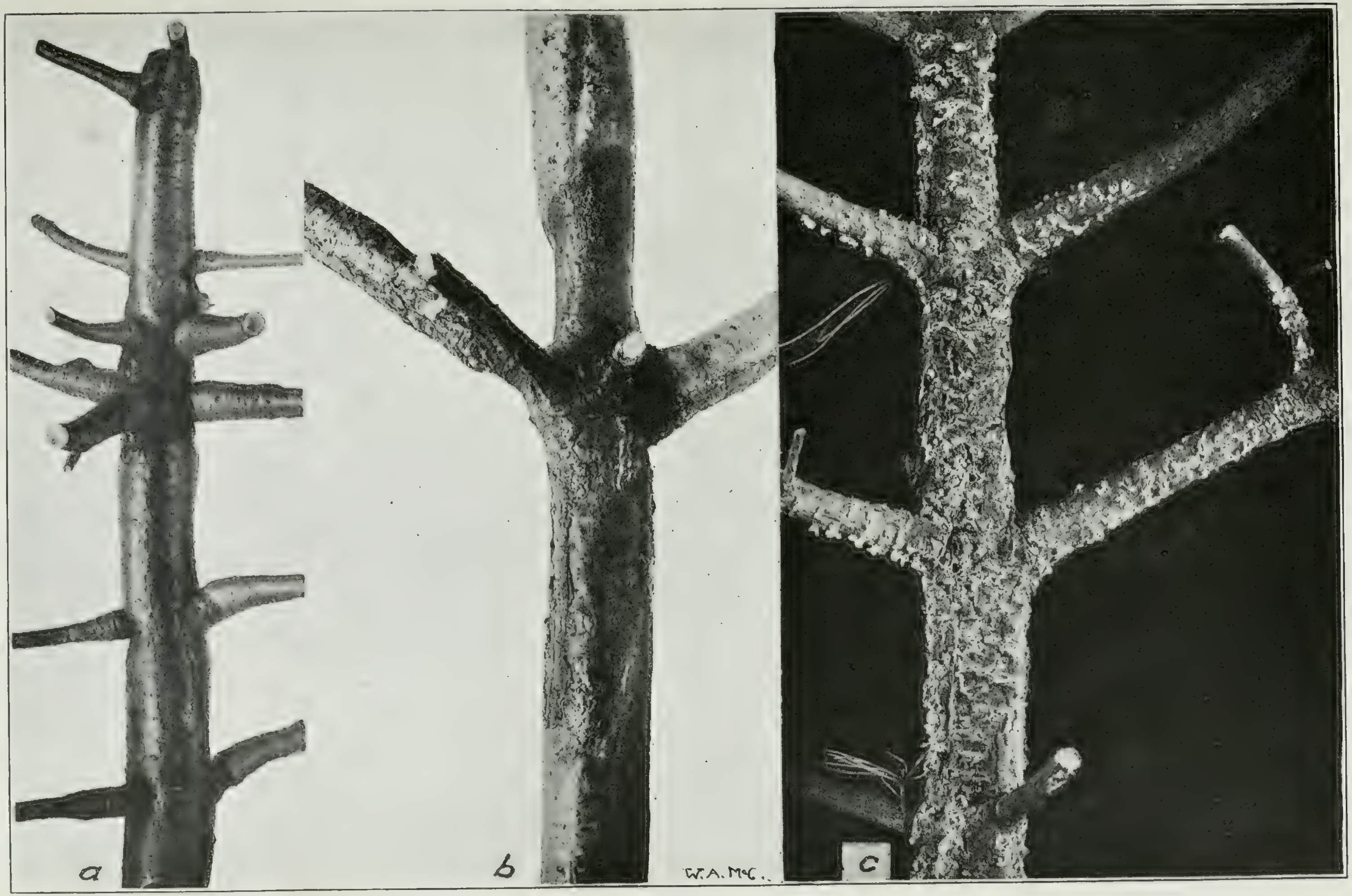
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TABLE III.—Showing the direct relationship which exists between the amount of disease and the number of tubers developed in a hill.

Plot.	Treatment.	Percentage of tubers affected with Powdery Scab.	Number of tubers per hill.
1	Corrosive sublimate 1:1[illegible]0	3·0	7·2
2	" " 1:2000	4·1	7·8
3	" " 1:3200	3·9	8·5
4	Formalin 1:300	5·5	8·8
5	" 1:600	4·6	8·8
6	Flowers of sulphur	6·5	9·4
7	Copper sulphate 1:170	4·2	6·2
8	"Seed" kept in warm room	34·3	9·7
9	Untreated	14·8	8·9

Further experiments of a preliminary nature were conducted on a small scale at Ottawa. They were designed to show in part, the effect on the disease of the hot water treatment as it is used for the loose smuts of cereals, and in part to throw more light on the effect of keeping "seed" tubers at various temperatures for different lengths of time. In the former particular the results are gratifying, but a considerable amount of further work will have to be done before any general conclusions can be drawn.

Improvement of the potato crop.—From time to time the Division receives applications from persons who, having heard of the use of evaporated potatoes, have become interested in the subject. They have evidently seen references in literature to a system largely practised in Germany which, it may be said, yields an important revenue in that country. In this country the installation of potato drying or evaporating plants, and the financial success to be expected from such work, would be very precarious under the present uncertain condition of the potato crop in the Dominion. The reason for such an expectation will be apparent to any business man, when it is pointed out that during the season 1914-15, the average price of potatoes was about 40 cents per barrel of table potatoes, whereas during 1915-16 the price was three times that, and more. Moreover, one year one part of the country may have a superabundant crop, but it generally finds a ready market in parts of Canada where the crop happens to be deficient. Thus, during 1914-15, Eastern Canada shipped large quantities to the West as far as Alberta, but during 1915-16 Alberta potatoes were largely in demand in the East. As long as farmers and shippers are able to dispose of their potatoes for table or seed purposes it will be waste of capital to evaporate potatoes. The reason for this is simple: Canada cannot yet rely every year upon a uniformly satisfactory crop of potatoes. Shipping and marketing facilities are not yet sufficient for the disposal of the crop, though large in certain localities, at a profit. Some years ago we were shown a large dump pile of potatoes that were grown and harvested on a farm in British Columbia. When they might have been shipped, it was found that it would not pay to ship them at the price that could be obtained for them. This might be used as an argument for the establishment of, at any rate, local evaporation plants. But that very same farmer probably had to buy his potatoes for his own use the following year. Would any manufacturing firm be able to afford idleness one year? Germany is using for evaporation only those potatoes left over after all her other requirements for domestic purposes, seed and other uses, have been fully guaranteed. Do we suffer yet in this country from over production—so much so, that we must look for some use for our surplus potatoes? The fact is, that we produce hardly enough potatoes, taking one year with another. Otherwise, the fluctuations in the price of this commodity would not occur or at any rate would not vary within such wide limits. The most important phase of



16-1916-73a.

White Pine Blister Rust.

(a) Early stage of the disease on a pine seedling. (b) Later stage on a young pine showing complete girdling of the stem. (c) An affected pine limb in spring, covered with the rust blisters. Above this rusted section the limb is dead.



White Pine Blister Rust; the stage on black currant leaves.

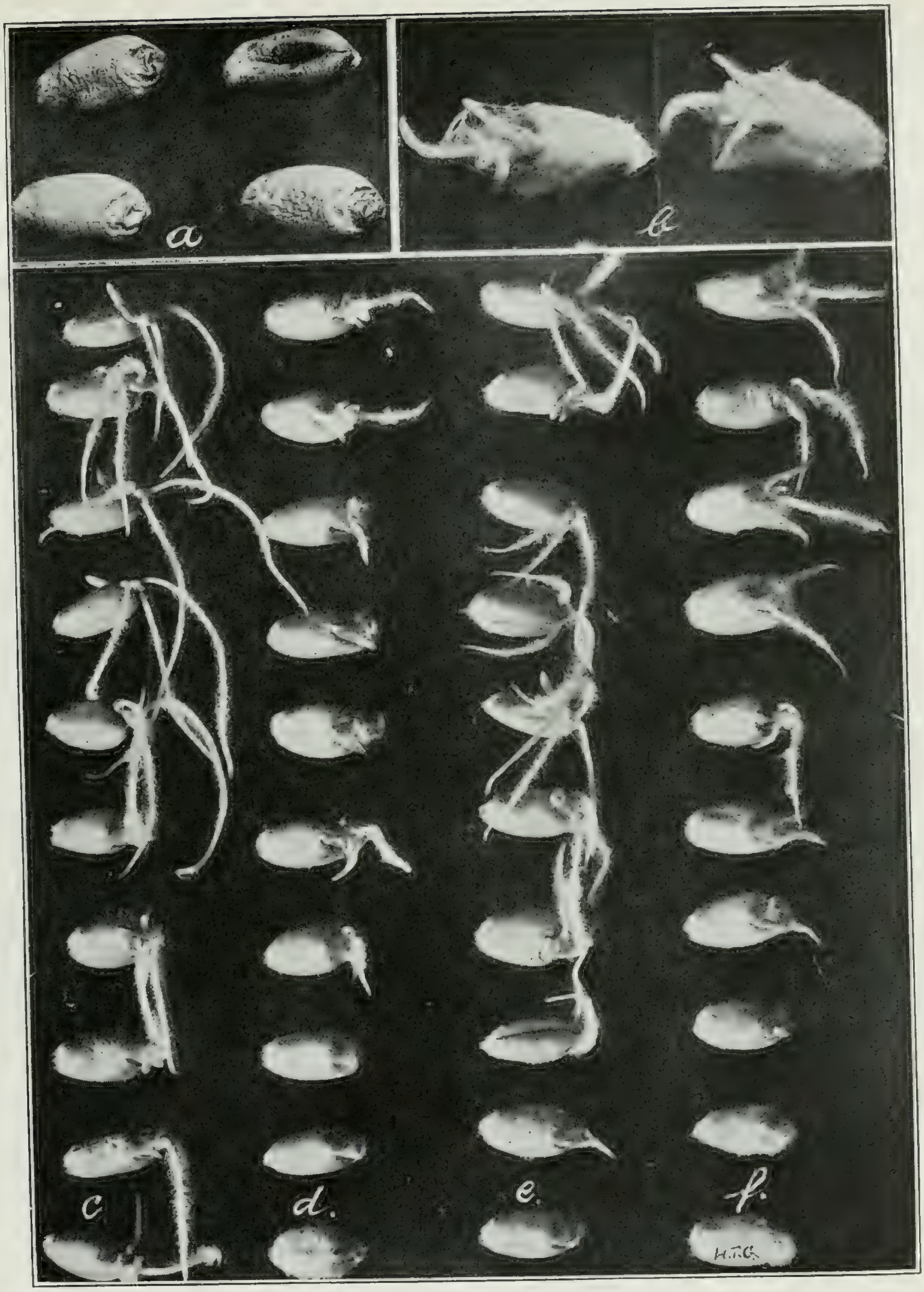


White Pine Blister Rust.

(a) Normal condition of healthy black currant shoots on October 3.
(b) Rusted shoots taken on the same day. They have been long defoliated by the rust and a new set of leaves has been formed by premature development of the winter buds. As all these secondary leaves will die in winter, the effect on the plant is very harmful.
(c) Spraying for currant rust. The two rows on the left were unsprayed, and were defoliated early. The two on the right were sprayed eight times with Bordeaux mixture. While not entirely rust-free, they kept their leaves till the normal time of leaf-fall.



Effect of wet season on badly drained field of potatoes.
In this case the potato crop is a failure. The water standing between the rows should have been carried off by shallow surface trenches, then the crop might have been saved.



Effect of wet weather on Wheat grains.

(a) Four wheat grains showing blackish colour.
(b) Same grains on germination become covered with mould. Under field conditions a large percentage will not produce plants.
(c) 10 seeds soaked for 6 hours in water then treated for $2\frac{1}{2}$ min. in sulphate of copper sol. 1·100. Mould entirely disappeared, germination good.
(d) 10 seeds soaked for 6 hours in water then treated for $4\frac{1}{2}$ min. in formalin sol. 1·400. Mould not quite controlled, germination slow.
(e) 10 seeds treated for $2\frac{1}{2}$ min. in copper sulphate sol. 1·100 without previous soaking. Mould not entirely controlled.
(f) 10 seeds treated for $4\frac{1}{2}$ min. in formalin 1·400 without previous soaking. Mould not much checked, germination least good.

Note.—The treatments tried are the same as employed for smut in grain. It will be seen to be of advantage when practising treatment described under "c".



Bitter Pit of Apples. — An apple showing bitter pit markings externally; one showing this very undesirable spotting after peeling the apple, and also section of same apple showing internal spotting.

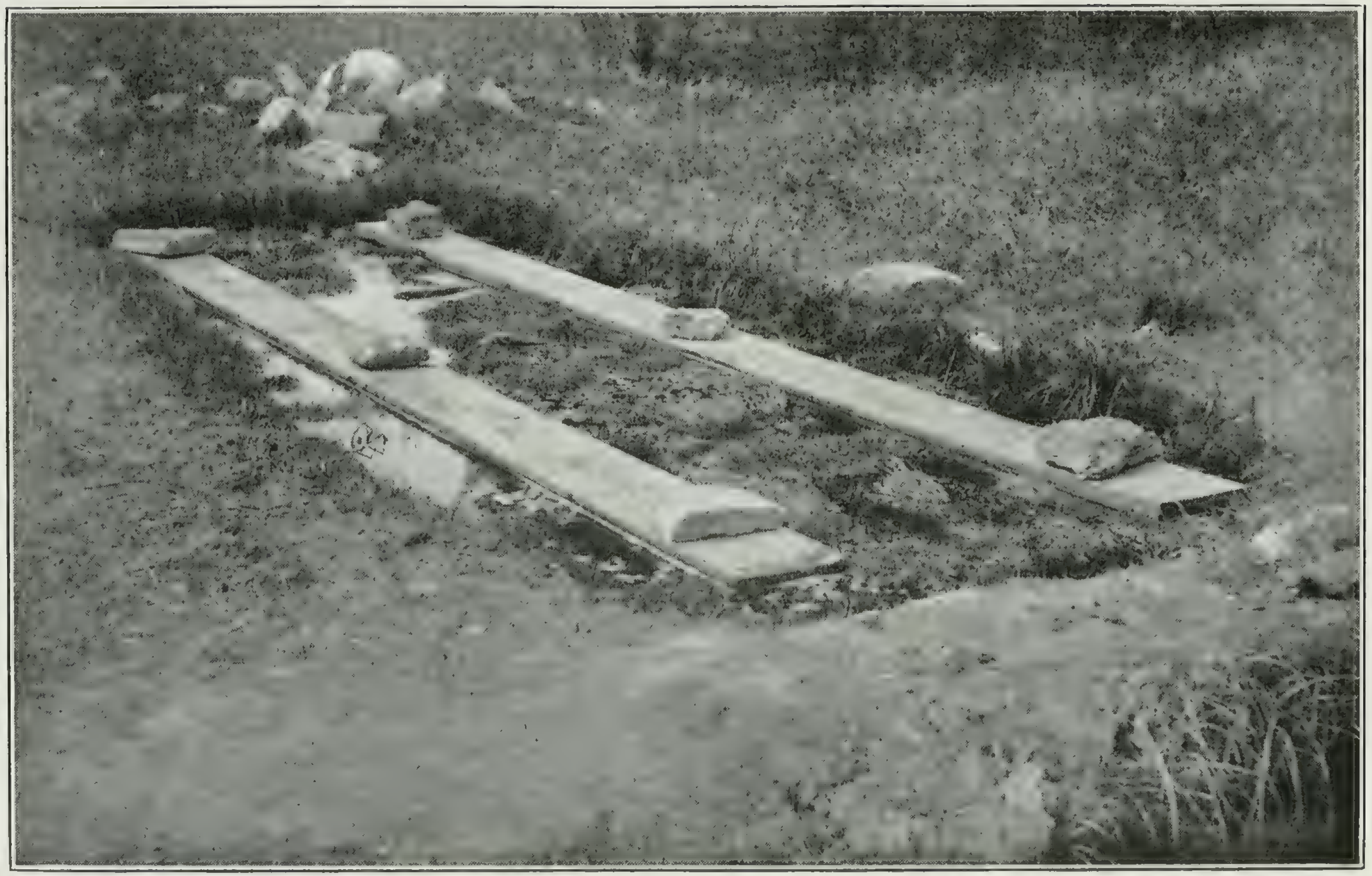


Photo by F. L. Drayton.

Experiments with Flax.—Retting tank dug in ground. Flax bundles are submerged in water being placed into these and allowed to remain until completely retted.

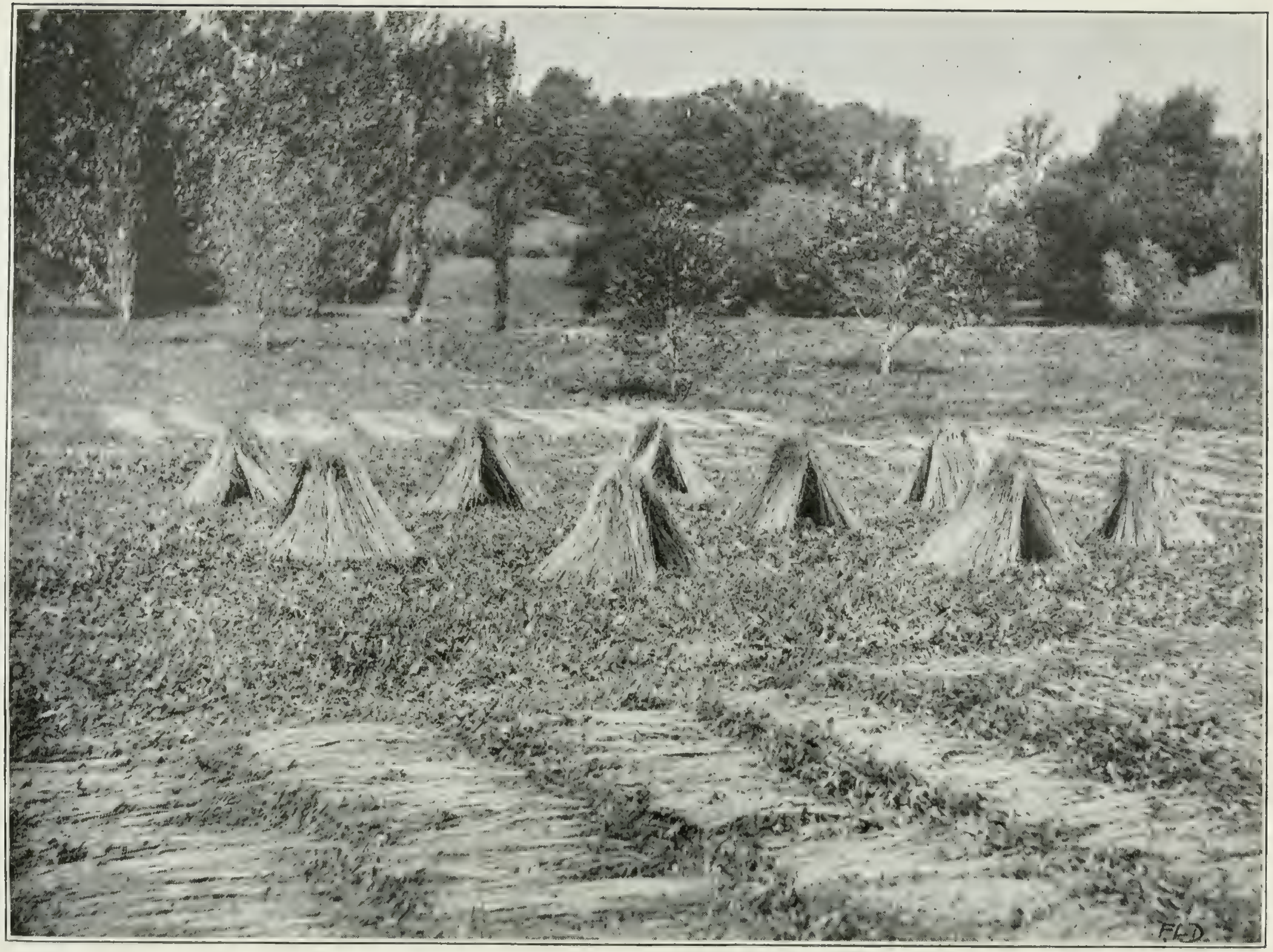


Photo by F. L. Drayton.

Experiments with Flax. — In the foreground retted flax spread in a thin layer on the grass to dry. Also showing method of "wigwaming" or "steepling".

the potato industry for Canada is uniform production, certain and reliable yields. If these ends be first achieved, it is a very simple step to producing the surplus of potatoes required for manufacturing purposes. We are concerned with the elimination of harmful factors which prevent or interfere with the production of a desirable crop. Every effort has been made in recent years to increase production. The consumer will be the person to reply to the question whether or not the increased production of potatoes has been a success, especially in years of unfavourable weather conditions. What then are the reasons which make this very important crop more or less uncertain?

For a number of years we have endeavoured to find this out and we believe we can satisfactorily explain a large number of crop failures during the last few years. The farmers are almost unanimous in blaming the weather for crop failures. This is to some extent the case, no doubt, but the weather very rarely is to blame for so much as the farmer. The director of Experimental Farms has expressed his opinion recently in a manner that well may be brought to the attention of all farmers again and again:—

> "Only very rarely indeed need any farmer have a really poor crop, much less a total crop failure in Canada. The Canadian farmer who will do his work wisely and well each year and all the year round need seldom or never fear but that a crop fair to good at least, and usually excellent will generously reward his every well-timed and well-planned effort."

This is absolutely true of the potato crop.

Potato failures or low yields are due to a variety of causes. Firstly, to unsuitable varieties, or to the use of varieties for some inexplicable reason, which do not yield the highest returns. Secondly, to the use of inferior seed. Thirdly, to depreciation of the crop by diseases. Fourthly, to imperfect storing.

Naturally, failures are also directly due to faulty cultural treatment of the crop and to unfavourable weather conditions. The study of varieties, from the points of view of yield and local suitability, has been carried on by the Horticultural Division of the Experimental Farms for a large number of years. "Potatoes have been grown in a small plot," so the Dominion Horticulturist states, "at the rate of over 700 bushels per acre at the Central Experimental Farm, but so great is the difference in the yield of varieties that, while one gave this large yield, another, planted at the same time, and in the same kind of soil, yielded only 154 bushels." The importance of planting productive varieties is obvious, but it is by no means certain that a variety yielding well in one locality will do the same in another. One would have to choose the best variety or varieties and might have to change the seed from time to time. The Prince Edward Island farmers have one favourite variety—whether or not it is the heaviest yielder on the Island does not apparently matter, since they have peculiar markets. In New Brunswick two varieties are most prominent—they are called for by the shippers and have the name. Whether they are the best yielders apparently does not matter, so there is considerable conservatism in some localities about potato varieties. Perhaps this, too, will have to be overcome to make the general production more uniform. At any rate, it is most important to grow the best and heaviest-yielding varieties. To establish or build up a market for the same should not prove so very difficult once the superior quality is well known. The next point to consider and one which is of more interest to us from our point of view, is the use of superior seed. Superior seed comes from a vigorous, uniform and pure strain, and last but not least, from a crop free from transmissible diseases, or diseases carried by the seed potato.

Potato diseases are distributed throughout the Dominion and a very heavy toll is paid to them. Some provinces have their peculiar potato troubles, some diseases occur everywhere. Diseases should be eliminated, when getting seed ready for planting, and

when the potatoes are growing in the field. There are a number of very important diseases, which cannot be identified in the tuber, which, notwithstanding, appears quite sound.

Thus, the Mosaic disease of the potato easily accounts for 10 per cent losses (= 1,200,000 bushels) in New Brunswick alone. It occurs elsewhere just as seriously, and when reference is made here to a province by name it should be regarded as a favourable sign that such province has recognized and knows its foe—while others may not.

Black Leg, a disease which is most readily eliminated with very little trouble, still causes considerable damage, and there are scores of others ever increasing themselves, and ever decreasing the vigour of the potato.

Among the crop diseases the worst is Late Blight. This causes immense damage to the fields. We presume it is well known that spraying potatoes will control Late Blight, just as applications of Paris Green will kill the potato bug. Yet there are many farmers who still claim "it does not pay to spray my potatoes." "It may do so elsewhere, but not where we farm," is a common expression. True, in Ontario, Late Blight is reported to cause little trouble—some years there is hardly any—therefore, few Ontario farmers spray, and pay the penalty in seasons like the last. But it is known that diseases can adapt themselves to new conditions; it is, therefore, risky not to spray. Take New Ontario, for instance. It will be found that that immense country will become a potato country. There are no serious diseases there now, to speak of. But with indifferent methods there will be. Surely it is worth one's while to prevent the establishment of destructive diseases. In other provinces farmers claim it does not pay to spray, the cost of production is large enough as it is and the profits will all disappear when they do spray. That is not always correct. It has been demonstrated in our experiments on private farms that an increase in yield of from 50 to 100 bushels per acre may result from spraying. If that increase alone does not pay you, then look into a phase of the advantages of spraying which is not or has not been generally taken into consideration. A sprayed crop is a sound crop; the tubers will fully mature, they will be free from rot and keep well. No losses from storing will be experienced in such cases. The unsprayed crop produces premature or immature tubers full of rot in years of blight. What will be left of this after a winter's storage? We have found an average net profit per acre from spraying amounting to $34.38; in individual cases more, in others less.

The next point is the depreciation of the crop in storage. The systematic work carried on under the Destructive Insect and Pest Act has revealed to us losses in storage amounting to often fully 17 per cent of the total crop of a province. Individual farmers have lost more than half the crop in storage. The storage conditions need much improvement.

When all losses from various sources have been eliminated, we may then commence considering what to do with our surplus.

It is a fact which is meeting with more and more recognition that the best way of improving the potato industry is by the use of "better" seed. That is the fundamental improvement which is necessary; because better cultivation, manuring, fertilizing and even spraying are in part thrown away on crops of low vigour grown from poor "seed." If a farmer has clean stock of high productive power and plants it in suitable soil he need not worry about the many obscure potato diseases such as Mosaic, Rhizoctonia, Leaf Roll and others, which are the cause of so many weak stands, because if the "seed" is as productive as it should be they will not be present. Now, one never sees a crop in which all the plants are of equal vigour, and while the differences are not all attributable to the set, yet it is an experimental fact that sets which are the produce of the most vigorous plants will tend to give larger yields than those derived from less vigorous ones. At all events the continued use of superior sets will eventually eradicate all diseases which are carried in the tuber.

OTTAWA.

The increased value of potatoes, coupled with a greater understanding of the importance of good seed, has created a demand for seed stock true to varietal character, of uniform vigour, free from diseases, and grown from prolific stock. This demand is well founded, and can be met only by vigorous rogueing and inspection of the potatoes in the field and in the cellars. A few growers are anxious to supply this market by producing potatoes of the best quality, but at the present time there is not sufficient of this stock to supply the present demand, which demand is bound to increase from year to year, as more interest is aroused among potato growers, knowing in a large measure where lie the undesirable factors.

It is therefore desirable to work along definite lines to effect improvements that will result in the elimination of all yield-decreasing factors. Good seed may be procured, or expected, from a crop free from diseases, of a good strain and vigour and of prolific yield. Since the seed potato bought in the market at the present time carries little or no guarantee that it is possessed of such desirable qualities, a start should be made in the field, by means of the application of a uniform method of field inspection that has been evolved after years of practical experience. Such a start will produce a quality of seed already much improved. One of the most striking features of a good many potato fields in the Dominion is the large percentage of foreign varieties to be met with in a field that should be composed of plants of one variety only. This feature is best observed at the time of flowering. Purity of variety is a very essential point. Every stray variety should be eliminated. Fields should be "rogued" for impurity of variety when the plants are in bloom, as the blossoms are frequently the only distinguishing characteristic. In practice, we have found it advisable to rogue, first, when the blossons are coming on, so as to catch early-blooming varieties, second, when in full bloom, and third, to catch late blooming varieties. In the case of some mixtures, such as Cumming's Pride and Irish Cobbler, it is difficult, if not impossible to recognise the rogues in this manner. However, they may be distinguished in the fall, as the Irish Cobbler matures early and the Cumming's Pride late.

If the impurities are more than 4 or 5 per cent and the consequent loss due to rogueing is very great, we recommend that only a part of the field (sufficient to produce pure seed for the next crop) be rogued or that the stray varieties be staked and dug up separately. All diseased or weak plants should be destroyed when pulling out stray varieties, and also later, from time to time, until the plants are mature, as many diseases become apparent just before maturity.

Experience indicates that a field should be rogued twice or more during the growing season. In fact it should be rogued regularly every two weeks from the blossoming period until the plants are practically mature, in order to get all the diseased plants and stray varieties.

Because of this necessity for frequent rogueing, the grower can accomplish it more easily, satisfactorily and thoroughly than can inspectors, who cannot visit a farm more than once or twice during the season.

Besides, such work should be done by the grower himself, since the conscientious man will always reap the benefit from the care which he has observed.

This practice of rogueing and field inspection carried on by the officers of this Division on a large number of farms has several particularly good features which are worthy of notice: (1) it should materially reduce the amount of disease present and improve the general stand; (2) by rogueing the field or a portion thereof a few times, we may succeed in getting the farmers themselves to take up the work; (3) it offers an opportunity of indicating to the farmers the amount of damage caused by disease, and of explaining methods of control; (4) it serves as a potato disease survey and enables us to determine which diseases are of economic importance; (5) field certification is a benefit to both the producer and the buyer. The producer is able to secure a price commensurate with the quality of his crop and the buyer knows that he is securing good stock for his money.

OTTAWA.

For several seasons we have practised such field inspection and for the use of the farmer and any other person who may desire to take up such work, we are publishing here the form used in our field inspection, from the study of which and its experimental application very valuable results may be achieved by the farmers themselves. They will easily be able to ascertain whether their present field of potatoes will have any chance to be considered worthy of recognition or not. At any rate it is strongly recommended to apply the requirements of this form to one's own crop uniformly all over the Dominion, where ultimately the good results are sure to become noticeable.

Dominion of Canada.

Division of Botany.

POTATO DISEASE CONTROL.

Field Inspection Report.

1. Name of farmer:

   Address:

   Road:
2. No. of field: Date of inspection:
3. Any inspection last year?
   If so, do you notice any improvement this year (which indicate)?

4.	Name of Variety.	Area.	Seed used per acre.	When planted.	Percentage of other varieties.

5. Have all foreign varieties been removed?
6. Diseases observed (the exact percentage of each disease to be stated):

(a) *Serious Diseases:*	Remarks.
Black Leg.....%	
Curly Dwarf.....%	
Leaf Roll.....%	
Mosaic.....%	
Wilt Diseases.....%	
Mi-ses.....%	

NOTE.—All individual hills showing symptoms of serious diseases should be removed in order to produce sound seed. If not removed field may be disqualified. Indicate in column "Remarks" whether or not removed.

(*b*) Less serious diseases (indicate as: absent, slight, moderate, severe).
Early Blight.
Late Blight.
Leaf Streak.
Rhizoctonia.
Tip Burn.
Other diseases or injuries observed which describe:

7. Where was the seed obtained?
Have seed tubers been treated before planting?
What solution was used?
Strength of solution?
Length of time of treatment?
How was the seed cut (to one or more eyes each set or are whole tubers used)?
Are sets planted singly or not?
When was the seed changed for the last time?
How often is the seed changed?
NOTE.—Explain advantages of hill selection for vigour, strain and yield.

8. Has the crop been sprayed?
What solution was used?
Strength of formula?
How many times has been sprayed?
When commenced?
At regular intervals? What intervals?
When was the last spraying applied?

9. Control of potato beetles. (Indicate whether absent, slight, moderate, severe.)
What poison is being used?
What amount per application?
Is poison used in combination with spraying solution?
What amount is added to.....gallons?
Any special application for beetles, before spraying was practised?
How many?

NOTE.—Hand grower a copy of Circular No. 9, "The Control of Potato Diseases," and advise him to follow the directions given.

10. Determine by count of section or sections of field accurate losses from diseases collectively from your list of individual diseases and calculate per acre—
One acre, how many plants?
How many diseased plants?
How many sound plants?
How many plants of other varieties?

11. Distance of rows apart?
Of plants in rows?
Planted in rows or furrows?

12. Nature of soil? Subsoil?

13. Situation of field (exposed, sheltered, slope, hill-top, low, in orchard, etc.)?

14. Condition of drainage (natural or artificial)?
In good working order? (If not, call attention to it).

15. Indicate clearly rotation followed:

16. General appearance of field (vigorous, lack of vigour, uniform height, lodging or erect, cared for or neglected):

17. How often cultivated?
Regularly or not?

18. Freedom from weeds (absent, slightly, moderately or very weedy):
Principal weeds:

NOTE.—If unable to identify, forward specimens to Dominion Botanist, Central Experimental Farm, Ottawa, attaching the number of the field and locality where gathered.

19. Have you any observations to make regarding conditions apparently favouring disease?

20. Describe weather conditions (normal, dry, excessively dry, wet, excessively wet, etc.)

NOTE.—A separate form to be used for each variety.
Signed:

OTTAWA.

As there are diseases in potatoes not recognizable in the tuber, so there are such diseases as Common Scab, Powdery Scab, Late Blight, Tuber Rot, Dry Rot, etc., that can only be determined from an inspection of the potatoes themselves after harvest. For this purpose a fall or tuber inspection is necessary and the following inspection form is recommended.

1. Name of farmer:
2. Post Office address:
3. Road:
4. Number and date given to field on inspection in summer No.....
   Date .....
5. Variety:
   Area planted: Yield in bushels:
6. Diseases observed on examining each tuber of a total of 500 tubers selected to represent bulk:

(a.) *Serious Diseases:*	1st I.	R.-I.	Remarks
Deep stem end browning *Verticillium albo-atrum* and *Fusarium oxysporum*	%		
Bacterial Rots	%		
Dry Rot (*Fusarium* spp)	%		
Late Blight Rot	%		
Powdery Scab	%		
(b). *Less Serious Diseases:*			
Common Scab	%		
Net Necrosis	%		
Rhizoctonia	%		
Silver Scurf	%		
Other internal diseases (which describe)	%		

7. Determine if possible whether disease increased during storage; use column remarks for report.
8. If more than 10 per cent of the serious diseases collectively, these comprising:
   In summer report: Black Leg, Curly Dwarf, Leaf Roll, Mosaic, Wilt Diseases; or more than 5 per cent "misses."
   In fall report: Deep Stem End Browning, Bacterial Rots, Dry Rot, Late Blight Rot, Powdery Scab.
   If more than 10 per cent "less serious" diseases individually, these comprising:
   In summer report, none;
   In fall report; Common Scab, Net Necrosis, Rhizoctonia, Silver Scurf, and other internal diseases.
   No certificate will be granted.
   (If Common Scab, Rhizoctonia, Silver Scurf is in excess of 10 per cent farmers may secure recognition of their crop, providing they are willing to remove the diseased tubers in excess. Then re-inspection will be necessary.)
9. Re-inspection date: (Enter findings in column R.-I.)
10. Where are the potatoes stored?
11. Describe conditions for storage: Disinfected:
    Ventilation good: poor:
    Temperature when examining?.....°F.
    Likely to vary? Considerably, little?
    Any idea of minimum: maximum: temperature?
12. Amount stored: date placed in storage:
13. How many used?
14. How many lost in storage?
15. Certificate was granted (a) at time of first inspection.
    (b) at time of second inspection.

Signed:

Plant Disease Inspector.

Date:

(This form to be attached to field inspection report).

OTTAWA.

The following is an account of work done along these lines in Prince Edward Island under the supervision of Mr. Murphy, and in New Brunswick, where it was in charge of Mr. Cunningham. Since these gentlemen will have charge of such work in Nova Scotia and Quebec respectively, the work will be extended in these provinces, and since the Ontario Department of Agriculture, at our suggestion, has also requested its district representatives to inaugurate this work for Ontario, the results promise to become highly interesting in a few years.

Mr. Murphy reports:—

A campaign was inaugurated in Prince Edward Island during the past season to impress the importance of these facts on the potato growers of the province. Inspectors who were thoroughly familiar with the question were sent to certain districts with instructions to explain the scheme to the growers and help them to obtain better "seed." It must be explained here that the problem of potato raising on the Island is not a simple one. While the country, on account of its situation and climate, is an ideal one for the crop, not second to any with which the writer is acquainted, the industry is limited by two factors—in the first place, by transit difficulties, which compel the export of the bulk of the crop in October, November and part of December, which in itself is an unfavourable time, a glut being easily caused on a market which is limited owing to the fact—and this is the second reason—that the variety almost universally grown is hardly a marketable commodity either for planting or eating outside Prince Edward Island itself and parts of Nova Scotia and Newfoundland. This confined our efforts in the "seed" potato business to filling the needs of the Island alone, but small as these are, it was an imperative necessity for the betterment of the industry. The plan which seemed to promise the best results was to go to the best districts and interest some of the growers in rogueing their crops, if their condition as regards disease warranted such a step. The inspectors were instructed to place their services at the disposal of the growers in carrying this out, not merely to mark the plants, but to take them out. This state of each crop was reported on suitable forms, the percentage of diseases present being recorded, as well as the amount of foreign varieties. Each crop was afterwards examined in the cellar and reported on in a similar way. The next step was to place those whom we had found to have good "seed" in touch with those who were in need of such, so far as we knew, and thus it was hoped in time to build up a small "seed" potato business within the Island, which would ensure a supply of good stock when it was required, and give some of the best growers an outlet and a market for their energy.

Considerably over one hundred farms were visited and a propaganda was carried on which will in time bear fruit. Further, a large amount of useful information and statistics based on actual counts of the amount of various diseases occurring in each crop were accumulated. The value of this is very great. Otherwise, the very abnormal season dealt the scheme a heavy blow. There has never been any domestic seed potato trade to speak of, and growers have not been in the habit of holding over stocks when a market could be found; so when prices advanced in the fall almost the entire available surplus, so far as one can judge in the absence of statistics, was exported. Further, those who had good stock would not hold it except in the hope of obtaining prices considerably in excess of the market rate, and as the latter was even then twice as high as the average price it was not to be expected that other growers would pay a doubly enhanced price for better stock so long as they had some of their own, no matter how poor.

One year's experience of the work has shown also that though it might be slower to induce each individual grower to select his own "seed" instead of getting a few men to select, and urging the others to buy from them, yet the educational effect of the former method would be very great and would probably compensate for the greater length of time required to attain equally widespread results. It is intended to continue the scheme in a modified form during the coming season

Mr. Cunningham reports:—

During the summer of 1915, the Division of Botany inaugurated a system of rogueing and field inspection as an aid to better potato production and as a means of endeavouring to meet these requirements. As a result, many applications have been received at this laboratory during the past winter and spring for information concerning the possible sources of good seed stock, which has been certified to by Government inspectors. The system which has met with such singular success during the first year, will be continued on a more extensive plan, as well as along improved lines, during the coming season, in conjunction with the work of the New Brunswick Potato Growers' Association.

During the past season, very few farmers failed to accept our offer to rogue their fields; all seemed anxious to receive and apply methods suggested by us for the improvement of their potato crop. Over one hundred fields in New Brunswick were rogued for impurities and diseased plants. The crops from thirty-three of these have been strongly recommended to prospective buyers as suitable for seed. A large number more were visited, but, because of the prevalence of disease or varietal impurities, reports were not made.

Potato spraying experiments.—"A." Account of experiments in New Brunswick by Mr. G. C. Cunningham, B.S.A., assistant in charge of Field Laboratory of Plant Pathology, Fredericton, N.B.

Two series of potato spraying experiments were conducted during the past season to determine the value of Bordeaux mixture when used under New Brunswick conditions. This seemed advisable, since there is some doubt as to its value under all conditions, particularly during years when Late Blight is absent.

The first series consisted of spraying potatoes growing on the different fertilizer plots at the Dominion Experimental Station, Fredericton, to determine whether or not the different fertilizers applied had any influence on the response of the potatoes to spraying with Bordeaux mixture. This, of course, will have to be continued for several years before any definite conclusions may be drawn, but the results secured this year are so striking, that it seems advisable to mention them here. The results clearly indicate that spraying materially increased the yields during the past season on nearly all of the test plots. The unsprayed section of plot 45, which was fertilized by applying 66½ pounds nitrate of soda, 50 pounds sulphate of ammonia, 186 pounds basic slag, and 50 pounds muriate of potash, gave 2⅝ bushels more potatoes per acre than the sprayed section. With this exception, all sprayed sections of the plots gave larger yields than the unsprayed sections. The largest increase was 103⅔ bushels per acre. This was obtained on plot 9, which was fertilized with 80 pounds nitrate of soda, 60 pounds sulphate of ammonia, 343 pounds acid phosphate, 343 pounds basic slag, and 120 pounds muriate of potash per acre. The average yield from the sixty-nine sprayed plots was 205 bushels per acre as compared with 163 bushels per acre from the sixty-nine unsprayed plots. This shows that there was an average increase, due to spraying, of 42 bushels per acre. No further conclusions are justifiable until further information has been obtained.

The second series of spraying experiments was conducted on farms in different sections of the province on ordinary field crops and also on the field crop at the Dominion Experimental Station, Fredericton, for a three-fold purpose: (1) To prove the value of spraying potatoes with Bordeaux mixture under New Brunswick conditions; (2) to determine the number of applications necessary in order to secure the best results; (3) to serve as illustration experiments conducted under farm conditions. These experiments were conducted on the farms of Mr. Fred. Warnock, Grand Falls, N.B., Dr. L. McIntosh, Hartland, N.B., Mr. A. B. Blackie, Woodstock, N.B., and on the Dominion Experimental Station, Fredericton, N.B.

On the farm of Mr. A. B. Blackie, 1¼ acres of Irish Cobblers and 1 acre of Green Mountains were set aside for experimental spraying. The Irish Cobbler patch was

divided into three sections; one sprayed three times, one twice, and a third left as a check, or unsprayed. The Green Mountain area was divided into five sections; one sprayed four times going both ways on the row, one sprayed four times, one three times, one twice, and one left as a control.

On the farm of Dr. McIntosh, Green Mountains and Irish Cobblers were sprayed, but owing to the influence of several factors which could not be controlled by spraying, these experiments were unsatisfactory and are not included in this report.

On the farm of Mr. Fred. Warnock, 1 acre of Carman No. 1 was set aside for experimental spraying. It was divided into four sections which were sprayed similarly to the Green Mountains on the farm of Mr. Blackie, except that the fourth application was omitted because of wet weather.

These plots were sprayed as nearly as possible at intervals of two weeks, but, owing to the wet weather, it was sometimes impossible to carry out this schedule. The spraying was started on July 23 and continued at intervals of two weeks until the required number of applications had been made.

Between the dates of the second and third applications, Late Blight became very prevalent and, as a consequence, the plants in unsprayed areas were killed to the ground. The sprayed areas were slightly affected in a few places, but the third application of the Bordeaux mixture checked the spread of the disease. By the last of August, the sections which were sprayed twice were badly infected and rapidly dying, while only slight traces of the disease could be found on the sections sprayed three times.

The Cobblers, in nearly every case, matured before the fourth application was made. The Green Mountains, which received four applications, and Carman No. 1, which received three double applications, were comparatively free from infection when examined on September 16. However, where the rows were sprayed four times both ways, there was only a minimum of the disease.

The results show that four or more thorough applications of Bordeaux mixture practically controlled the disease and gave markedly increased yields. Practically the same conditions existed on the plots sprayed at the Dominion Experimental Station, Fredericton. It should be noted however, that spraying was not commenced until the plants were quite large and better results might have been secured had the work been started earlier in the season.

The following tables give the results obtained from spraying with Bordeaux mixture on the different farms:—

RESULTS OF SPRAYING POTATOES ON THE FARM OF A. B. BLACKIE, WOODSTOCK, N.B.

IRISH COBBLERS.

Treatment.	Marketable per acre.	Small per acre.	Total per acre.	Difference in marketable per acre	Difference in total per acre.
	Bush.	Bush.	Bush.	Bush.	Bush.
Sprayed three times	208	38½	246½	34	40½
Sprayed twice	190	43½	233½	16	27½
Unsprayed	174	32	206		
GREEN MOUNTAINS.					
Sprayed four times both ways	109	9½	118½	54½	46½
Unsprayed	54½	17½	72		
Sprayed four times	95	6	101	40½	29
Unsprayed	54½	17½	72		
Sprayed three times	89	6	95	34½	27
Unsprayed	54½	17½	72		
Sprayed twice	79½	13½	93	25	21
Unsprayed	54½	17½	72		

OTTAWA.

RESULTS OF SPRAYING ON THE FARM OF F. W. WARNOCK, GRAND FALLS, N.B.

CARMAN No. 1.

Treatment.	Marketable per acre.	Small per acre.	Total per acre.	Difference in marketable per acre	Difference in total per acre.
	Bush.	Bush.	Bush.	Bush.	Bush.
Sprayed three times both ways	267	14½	281½	220½	162½
Unsprayed	46½	72½	119		
Sprayed twice both ways	218	43½	261½	171½	142½
Unsprayed	46½	72½	119		

RESULTS OF SPRAYING POTATOES ON THE FIELD PLOTS AT THE DOMINION EXPERIMENTAL STATION, FREDERICTON, N.B.

PLOT No. 1, GREEN MOUNTAIN.

Treatment.	Marketable per acre.	Small per acre.	Rot. per acre.	Total per acre.	Difference in marketable per acre	Difference in total per acre.
	Bush.	Bush.	Bush.	Bush.	Bush.	Bush.
Sprayed	221	29	¾	230¾	78½	84¼
Unsprayed	142½	22	1½	166		

PLOT No. 2, GREEN MOUNTAINS.

Sprayed	212	22½	½	235	47	46
Unsprayed	165	22½	1½	189		

PLOT No. 3, IRISH COBBLERS.

Sprayed	258	31	2	291	68½	62½
Unsprayed	189½	36½	3½	228½		

"B." Account of experiments in Prince Edward Island, by Mr. P. A. Murphy, B.A., assistant in charge of Field Laboratory of Plant Pathology, Charlottetown, P.E.I.:—

The principal experiment was carried out on the farm of Mr. A. E. Dewar, Charlottetown, to whom the author is much indebted for the results attained. The conditions were ideal for experimental purposes, as the potatoes were planted in narrow plots between the rows of trees in an orchard, thus facilitating spraying with different mixtures and minimizing the spread of blight from one plot to the next.

The experiment was divided into two parts, the first being designed to test the effect of Bordeaux mixture of the 6:4:40 formula against unsprayed plots. There were twelve plots, six sprayed and six unsprayed, the varieties used being Green Mountain, Dakota Red and McIntyre. On account of the way in which the varieties were planted, it was necessary to arrange the sprayed plots and the corresponding

checks end to end instead of side by side. While it is possible that soil variation may have influenced the result under this arrangement more than if the plots were side by side, yet it is unlikely, on account of the known uniformity of the ground, the number of plots, and the fact that the checks were placed alternately at the north and south ends of the rows.

Spraying was carried out five times, at intervals of two weeks, with Bordeaux mixture made up of 6 pounds of copper sulphate, 4 pounds of quick lime and 40 gallons of water. It was applied with a knapsack sprayer and sufficient was used on each occasion to cover the foliage very thoroughly. The amount per acre varied from 100 to 200 gallons. The last spraying, which was applied on September 24, was probably of little or no use, as the plants were killed by frost a few days afterwards. The first spray was put on on July 29, a date which was unavoidably late, and which, though it antedated the open appearance of the blight by a considerable time, may explain why the increase in yield was not even greater than was obtained.

TABLE I.—Showing the effect on potatoes of five sprayings with Bordeaux mixture as against similar potatoes unsprayed, the yields being given in terms of plots of one-fortieth of an acre.

Plot.		Variety.	Yield per one-fortieth acre in pounds.			Increase in marketable potatoes per one-fortieth acre plot. pound.
No.	Treatment.		Late blight rot.	Market-able.	Total.	
2·1	Bordeaux...	McIntyre.....	0·0	260·5	342·5	151·5
2·2	Check.....	"	1·0	109·0	196·0	
4·1	Check.....	Green Mountain.....	2·0	147·0	220·5	
4·2	Bordeaux...	"	1·5	343·0	417·5	196·0
5·1	Bordeaux...	"	0·0	370·0	409·0	168·0
5·2	Check.....	"	0·0	202·0	248·0	
6·1	Check.....	Dakota Red.....	0·0	279·0	333·0	
6·2	Bordeaux...	"	0·0	374·0	418·0	95·0
7·1	Check.....	"	0·0	228·0	336·0	
7·2	Bordeaux...	"	0·0	418·5	466·5	190·5
8·1	Bordeaux...	"	0·0	420·0	456·0	72·0
8·2	Check.....	"	0·0	348·0	420·0	

The next table, II, gives the same results in terms of an acre together with the value of the increase and the net profit due to spraying. The actual cost of the operation was used in making this calculation although the work was done by hand and on an experimental scale. To spray one acre five times as we did it cost $14.12, whereas with the price of materials as it was last season the cost should not have been much in excess of $8, or $1.60 per acre per spraying, that is assuming that the work were done on a larger scale and in the most economical manner possible. It should be borne in mind also that the profit given represents merely the increased profit due to spraying after the cost of the operation has been paid for. To obtain the total profit this figure should be added to whatever profit was realized in growing the potatoes in the check plots.

OTTAWA.

TABLE II.—Showing the effect on potatoes of five sprayings with Bordeaux mixture as against similar potatoes unsprayed, the increase in yield and profit being given in terms of one acre.

Plot.		Variety.	Increase in marketable potatoes due to spraying.	Value of increase at 50 cents per bushel.	Net profit per acre from spraying.	Average net profit per acre from spraying.
No.	Treatment.					
			Bush.	$ cts.	$ cts.	$ cts.
2·1	Bordeaux...	McIntyre.....	101·0	50 50	36 38	
2·2	Check.....	"	.....	.....	.....	
4·1	Check..	Green Mountain..	.....	.....	.....	
4·2	Bordeaux...	"	131·0	65 50	51 38	
5·1	Bordeaux...	" ...	112·0	56 00	41 88	
5·2	Check..	" ...	.....	.....	.....	
6·1	Check.	Dakota Red.....	.....	.....	.....	34 38
6·2	Bordeaux...	" ...	63·0	31 50	17 38	
7·1	Check.....	"	.....	.....	.....	
7·2	Bordeaux...	"	127·0	63 50	49 38	
8·1	Bordeaux.	"	48·0	24 00	9 88	
8·2	Check..	"	.....	.....	.....	

The result of this experiment shows conclusively that in a season like that of 1915, spraying potatoes is a profitable undertaking in Prince Edward Island. To the question which is so often asked, "Can we afford to spray our potatoes?" it gives the answer that you can scarcely afford to grow them without spraying because spraying is responsible for the bigger share of the profit. It has been objected that the problem is a peculiar one in that province firstly because the variety grown is said to be very resistant to the blight and that only in an abnormal season like that of 1915 is it seriously affected. As to this point the author is unable to speak from experience, but the fact that spraying increased the yield of that variety at the rate of 101 bushels per acre, or 4 bushels more than the average of the three varieties combined, indicates that it is not highly resistant. On the other hand, it is said that the selling price of potatoes is so low as a rule that such an expensive treatment would not pay. This is a point which remains to be seen. However, if we venture on an estimate and assume that a farmer is more likley to obtain an increase of 50 bushels per acre than 97 bushels on account of less thorough spraying, and if we assume also that five sprayings cost $8 per acre, then if potatoes sell for 25 cents a bushel the net profit due to spraying (over and above whatever profit might be realized from growing them unsprayed) would be $4.50. It is unfortunately a fact, however, that with copper sulphate at its present price the cost of five sprayings will be much in excess of that amount, so much so indeed that potato spraying is not now an economical proposition. It is safe to state that in this province under average conditions it does not pay to spray this crop when copper sulphate costs more than 15 cents per pound.

Comparison of Bordeaux mixture and Kil-tone.—"Kil-tone" is a ready-to-use Bordeaux paste, made presumably by precipitating the copper in a solution of copper sulphate by means of lime in some form, the sale of which was pushed considerably in the Maritime Provinces last season. It much resembles the preparation put on the market in England under the auspices of S. U. Pickering, F.R.S., and known as "Woburn Paste", but whether it is manufactured in the same way, by the use of lime

water instead of milk of lime, the writer was unable to discover from the representative of the makers.

A liberal supply was placed at the disposal of the Field Laboratory for experimental purposes, and, as it was a matter of importance to determine if this substance with which a number of farmers were being induced to spray, practically all for the first time, were of real utility, the officer in charge undertook to test it against plots sprayed with Bordeaux mixture and unsprayed check plots. The experiment was carried out at three centres, one being on the same farm as the Bordeaux experiment and the others on the farms of Mr. J. A. Taylor, Wilmot road, and Mr. D. Reid, near Summerside. The plots at the last centre were accidentally disturbed during the course of the season and for that reason the results are not included in the report.

The Bordeaux mixture used was made up according to the 6–4–40 formula (6 pounds of copper sulphate, 4 pounds of quick-lime and 40 gallons of water), and it was used five times at intervals of two weeks beginning July 30. Sufficient spray was applied in each case to cover all the foliage thoroughly. The Kil-tone was made up according to the makers' directions and was applied as nearly as possible in the quantities they recommend. It was found, however, that to cover all the tops even moderately well with a knapsack sprayer called for the use of larger quantities than they stated, and sufficient was used to give all the foliage a coating. Both Bordeaux and Kil-tone were applied throughout on the same day. The plots were arranged in the Dewar experiment somewhat as described for the Bordeaux plots, the first series reading from north to south Kil-tone–Check–Bordeaux, and the second series reading in the same direction Bordeaux–Check–Kil-tone. The plots were side by side in the Taylor experiment (9.1, 9.2, 9.3).

TABLE III.—Showing the relative effect of spraying potatoes five times with Bordeaux mixture and five times with Kil-tone, as against unsprayed potatoes, the yields being given in terms of plots of one-fortieth of an acre.

Plot.		Variety.	Yield per fortieth acre in pounds.			Increase in marketable potatoes per fortieth acre plot.
No.	Treatment.		Late blight rot.	Marketable.	Total.	
						Lb.
1·1	Kil-tone	Green Mountain	13·75	364·0	443·0	217·0
1·2	Check	"	8·25	147·0	224·0	
1·3	Bordeaux	"	0·0	419·0	470·0	272·0
3·1	Bordeaux	Early Rose and McIntyre	0·75	318·0	354·0	153·0
3·2	Check	"	16·75	165·0	209·0	
3·3	Kil-tone	"	0·0	309·0	366·0	144·0
9·1	Bordeaux	McIntyre	0·0	238·5	297·0	67·0
9·2	Check	"	0·0	171·5	228·5	
9·3	Kil-tone	"	0·0	223·0	280·0	51·5

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TABLE IV.—Showing the relative effect of spraying potatoes five times with Bordeaux mixture and five times with Kil-tone, as against unsprayed potatoes, the increase in yield and profit being given in terms of one acre.

Plot. No.	Plot. Treatment.	Variety.	Increase in marketable potatoes due to spraying.	Value of increase at 50 cents per bushel.	Cost of spraying per acre.	Average net profit per acre from spraying.
			Bush.	$ cts.	$ cts.	$ cts.
1·1	Kil-tone	Green Mountain	145	72 50	15 88	56 62
1·2	Check	"	.....	.....	.....	
1·3	Bordeaux	"	181	90 50	14 12	76 38
3·1	Bordeaux	Early Rose and McIntyre	102	51 00	14 12	36 88
3·2	Check	"	.....	.....	.....	
3·3	Kil-tone	"	96	48 00	15 88	32 12
9·1	Bordeaux	McIntyre	45	22 50	14 12	8 38
9·2	Check	"	.....	.....	.....	
9·3	Kil-tone	"	34	17 00	15 88	1 12

TABLE V.—Summary of comparison of Bordeaux mixture and Kil-tone, showing increase in yield, cost of spraying and profit from spraying per acre.

—		Bordeaux mixture.	Kil-tone.
Average increase in marketable potatoes over checks	Bush.	109	92
Difference in favour of Bordeaux mixture	Bush.	17	.....
Cost of spraying	$	14 12	15 88
Average net profit from spraying	$	40 55	29 95
Difference in favour of Bordeaux mixture	$	10 60	.....

These tables speak for themselves. Kil-tone is retailed in small quantities in Prince Edward Island at 17 cents per pound, copper sulphate being sold under the same conditions at 11 cents or less per pound. The relative cost of these two substances would hardly be very different in more normal times. As a result of the higher price, it cost us $15.88 to spray 1 acre five times with Kil-tone, whereas spraying five times with much larger quantities of Bordeaux mixture cost $14.12. To this difference must be added the lower efficiency of the prepared substance, valued at the price of 17 bushels of potatoes, making in all a figure of $10.60 in favour of Bordeaux mixture. Thus is added another testimony to the fact that there has not yet been discovered a compound which will compare in cost or efficiency with home-made Bordeaux mixture for spraying potatoes.

THE EFFECT OF WET SEASONS ON GRAIN.

(Plate LVII a-f) Sooty ear of wheat.—A large number of samples of wheat have been received from the West in the laboratories of this Division, showing a more or less pronounced sooty appearance or black specks covering the ears. Field observations were also made during the latter part of the season in Ontario and the Maritime Provinces, which revealed the same conditions; in some instances the whole wheat plant in the stook was almost black.

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It is quite natural that farmers, finding their wheat assuming this colour, should become very anxious and eagerly seek advice. Since these conditions seemed to prevail universally this season, the following account has been prepared with a view to assure farmers that these conditions are primarily of a seasonal nature, and only in rare instances will they cause material losses. The discoloration is exclusively due to certain micro-fungi, of which the development is greatly favoured during wet seasons.

The commonest fungus of all is *Cladosporium,* probably the widely distributed species *herbarum* of Link. This causes the "sooty ear" proper. According to the quantity of fungus material present, the ears of wheat will appear either as if wholly covered with soot or as if speckled with it.

Generally speaking, "sooty ear" will appear in wheat that has been cut and exposed for a time to moist or rainy weather. Sometimes this condition will appear on the uncut wheat, particularly when the grain is nearly mature and rain prevents harvesting.

The same phenomenon is also known to occur before maturity of the grain, and may at times be directly due to excessive rains, but more often to the premature death of the leaves following upon summer drouth, which causes the grain to ripen prematurely and assume a shrivelled appearance. Indeed, this look is imparted by almost any agent which causes the premature death of wheat plants.

In all the instances referred to this fungus appears as a secondary symptom and inflicts little or no damage on the grain itself.

It is very doubtful whether the fungus ever causes grain to become shrivelled. Some observers have so recorded, but the evidence is not at all conclusive. We personally have not been able to attribute any losses of grain to this fungus. Still it is not unlikely that when exceptionally moist weather occurs during the flowering period of wheat, this fungus may appear and frustrate the pollination of the ovary and thus cause only imperfectly developed grain. In rare instances, however, the fungus will produce discoloration of the grain itself, when left too long in the ear on the field.

Since it is impossible to prearrange suitable weather, it is equally impossible to suggest any means of preventing this condition. It may be advisable, when periods of wet weather have been forecasted, to cut the wheat a little early and endeavour to bring it into the barn or other shelter before it is exposed to prolonged rains. When, however, rain falls continuously while the wheat is in the stook, farmers should do their best to hasten the drying of the grain by frequent turning over of the sheaves, or by using rainproof covers for grain of special value or for special purposes.

The appearance of the ears, however, is really more alarming than the damage done warrants.

Glume spot of wheat.—Another entirely different kind of ear discoloration was also being met with this year. It was observed in the growing plant, but would, of course, show also in plants in the stook. In this case the ears showed no sooty mould; but the glumes, or seed-covering scales, showed reddish-brown to chocolate-brown spots, giving the affected ears a much darker appearance than that of the sound ones. This "glume spot" is common in Europe and has been frequently observed by other investigators as well as ourselves on this continent. Towards the end of the season these spots show minute fruiting bodies filled with numerous spores. The fungus has been identified as *Septoria glumarum* Pass. The fungus rarely penetrates to the grain, hence does little or no damage to the crop. It is especially common during wet seasons.

Wheat scab.—The popular name which has been given to this disease is not as descriptive as could be desired, since our interpretation of scab is something very different from this appearance. In the Maritime Provinces wheat scab was apparently common this year, but the damage was slight. Its effect on the plants is more apparent than real. Farmers observing this trouble in their wheat are naturally

anxious about it, but they can be assured that the damage which this disease causes in the Dominion is negligible. We have found it causing about 1 per cent loss; no doubt continued rainy weather may be responsible for greater damage.

The appearance of the diseased heads is very characteristic. We can invariably recognize the disease by the bluish-brown discoloration of the haulm just below the ear for about 2 to 3 inches. If such an ear is cut off and the spikelets examined, there will be no difficulty in detecting at the base of some of them a fine rose-coloured deposit apparently growing from below the covering scale or glume. The affected spikelets, and the grain contained therein, are dead. Sometimes the central portion of a whole ear is killed off; sometimes all the portion above the infection is dead, while below the infection the grain may still be normal.

The disease is widely distributed in Canada. The fungus to which the production of the reddish deposit is due was long known as *Fusarium roseum* Link., but since the perfect stage of the fungus has apparently been discovered, the disease has received the name *Gibberella Saubinettii* (Mont.) Sacc.

It is not unlikely that partly infected grain on germinating may be destroyed by fungus mycelium, but we have no evidence to cause us to believe that the disease is conveyed by diseased grain. Were this the case, the damage would be sure to be considerable. But, apparently, the fungus being a very common one in nature, attacks wheat from the exterior by wind-borne spores, and here is where continued moist or rainy weather exerts its favourable influence on the development of this fungus disease.

"Bitter Pit" or "Fruit Pit" of Apples.—In the botanist's report for the year 1910-11, p. 244, was published a preliminary note on Bitter Pit, accompanied by plate IX A. In the report for 1911-12, p. 205, reference was made to the same trouble and the researches of Dr. Jean White and Professor Ewart of Australia were briefly reviewed. Later, in the 1913 report, p. 489, a review was given for the benefit of the Canadian fruit growers of Professor D. McAlpine's (of Australia) first report on his Bitter Pit investigations. Professor McAlpine's final report has now been received through the courtesy of Mr. D. H. Ross, Trade Commissioner of the Canadian Government, Melbourne, Australia. Since the disease is of uncommon interest to the Canadian fruit growers, to whom it annually causes very considerable losses, it will be of interest to acquaint them briefly with the recommendations made by Professor McAlpine, which he has shown will largely prevent this serious trouble.

The reports themselves are very voluminous, and an abundance of work is recorded. They comprise four volumes of 775 pages text and some 170 plates with more than 400 figures, which doubtless constitute a record publication on the subject of one disease.

As a result of careful experiments and an exhaustive study, Professor McAlpine's conclusions may be summarized as follows:—

"In picking and packing, apples should be handled as carefully as eggs, the slightest bruise will produce a flaw in the flesh.

"Trees should not be allowed to bear too early. Respiration of the fruit is slowed down at 32° F.; keeping fruits at that temperature will retard Bitter Pit. This temperature also arrests the ripening process. A uniform cold storage temperature ranging from 30° to 32° F. will prevent freezing of the fruit and will prevent Bitter Pit from developing. Temperature variations must be avoided. Varieties vary considerably in their susceptibility. Fruit growers are advised to select the best immune commercial varieties for the district, when planting new orchards. Excessive supply of nitrogen encourages pitting. Ploughed under cover crops seem the best sources of supply for nitrogen. Steady rather than spasmodic growth should be aimed at. If the soil is in good condition and well cultivated, manuring should be necessary only when the trees come into full bearing. The necessary phosphoric acid and potash should be

supplied every year—the phosphoric acid as superphosphates of lime, and the potash as sulphate of potash. Low-lying swampy land favours Bitter Pit; well-drained land tends to lessen it.

"Severe pruning produces a virulent form of pit, whereas light pruning is a reducer of pit, or prevents it altogether. Artificial irrigation—the sudden change from dry to wet conditions is the best known means of producing Bitter Pit—should be practised during the fruiting season only when necessary to equalize the moisture contents of the soil. Uniform moisture supply is very important to prevent Bitter Pit.

"In order to reduce Bitter Pit to a minimum, it is necessary to have the tree well shaped, so as to be equally developed all round, to prune it so that the fruit is evenly distributed over the tree and not confined to a few main branches. Regularity in size and growth and ripening is very important."

We quite agree with Professor McAlpine's advice. Although the climatic and other conditions of Australia may vary considerably from those in Canada, it is most judicious to aim at the "regulation of forces" suggested by this author. We err too often in the correct treatment of our orchards. Nature aids herself; man—in introducing apple culture where formerly wild shrubs or forests grew—must be patient and study the requirements of the trees, under which they will best perform their natural functions of growth and development. Then, only, such troubles as Bitter Pit will slowly disappear. It would be of invaluable assistance to the success of eliminating Bitter Pit, if fruit growers would record and inform us of the resistance of varieties in their particular regions. (see Plate LVIII).

III. ECONOMIC BOTANY.

(By John Adams, M.A., *Assistant Dominion Botanist.*)

During the year, 1,439 specimens were received for identification. As compared with 955 for the previous year this represents an increase of 50 per cent. Some were sent in during each month of the year and every province of Canada was represented, including the Yukon Territory. A number of specimens had to be forwarded to the Royal Botanic Gardens, Kew, England, for identification, as there were no similar specimens in the herbarium or arboretum to compare with them. A considerable number of the specimens sent in were weeds and information was desired on the means of eradicating them. In many cases inquiries were also made as to the best method of destroying noxious weeds by means of chemical sprays, etc.

There was also a considerable number of plants sent in which were either poisonous or were suspected of poisoning live-stock. One farmer in British Columbia reported having lost thirty-six horses and sixty-five cattle in six years. Another farmer in British Columbia reported the poisoning of his milch cows by Loco weed (*Oxytropis Lamberti Pursh.*) A farmer in Prince Edward Island had five cattle poisoned, and there was a number of other cases of poisoning in other parts of the country. Among the poisonous species sent in during the year were *Veratrum viride* Ait., *Zygadenus venenosus*, S. Wats., *Daphne Mezereum* L., *Cicuta Douglasii* Coult. and Rose, *C. maculata* L., *Oxytropis Lamberti* Pursh., *Kalmia angustifolia* L., *Datura Stramonium* L., *Hyoscyamus niger* L., *Solanum nigrum* L., *S. Dulcamara* L. There were also several requests for literature with reference to poisonous plants.

Among the plants received for identification was a number of species of seaweeds. The extraction of potash from the larger kelp-weeds is a subject of considerable economic importance at present, but we have no specimens or literature to serve as a guide in identifying plants of this group.

A large number of requests was received for Bulletin No. 23 on Medicinal Plants, and many inquiries were received from persons who wished to know the names of

seedsmen and nurserymen who stocked medicinal plants; others desired information regarding the addresses of firms who purchased drug-plants. In a few cases we were able to supply seeds of these plants to those who wished to try them.

A beginning was made in the culture of medicinal plants and seeds of different species were sown. Henbane behaved as an annual; belladonna and marshmallow flowered and fruited the same year as sown and survived the winter satisfactorily. Spearmint also made considerable growth during the first year, although it did not flower, and is apparently also quite hardy. Fennel, tansy and rue grew well and have survived the winter successfully. The snowfall was excessive and consequently it will be necessary to continue observations for a few years before drawing any general conclusions about winter-killing.

A number of inquiries was received in reference to the culture, etc., of wild rice, chicory, and mustard. As chicory must be dried before it is ground, its cultivation can only be profitably undertaken by farmers within reach of a drying-kiln. The demand for this article is limited and as the roots are heavy, the freight on undried roots for any considerable distance would be excessive. At present, in Eastern Canada, the roasting of chicory appears to be carried out by only one firm in the province of Quebec. Mustard appears to be a more satisfactory crop, as the seeds occupy but little space and the freight, even to a more distant market, is lighter in proportion to the value of the product. Both chicory and mustard, however, like medicinal plants, belong to the class of special crops and should only be grown by those who manufacture them in sufficient quantity to meet the popular demand. Unless a farmer can arrange with a manufacturer beforehand as to the quantity required and the approximate price it is rather a hazardous experiment to grow any of these crops unless in very small quantities.

Numerous inquiries were received from persons in different parts of Canada about books and literature dealing with the flora of their respective provinces. Many of these were doubtless teachers, and it is encouraging to see the interest manifested in the study of native plants. It is somewhat disappointing to have to reply that with the exception of some general works and bulletins of a somewhat limited scope dealing with the commoner weeds, there are no modern books dealing in an exhaustive manner with the different provinces and written in such a way as to be especially suited to teachers.

Many inquiries of a miscellaneous nature were received during the year, such as the manufacture of essential oils from various plants, the vitality of weed seeds in the soil, the removal by chemical methods of low forms of plant life (algæ) in water reservoirs, etc.

Every year some letters and specimens for identification are received, but the sender omits to sign his name or to enclose a slip stating whom the specimens are from. Disappointment must inevitably ensue, but it is evident that the responsibility does not rest with this Division.

There was a considerable amount of correspondence relating to the growth of flax for fibre and the utilization of waste flax-fibre for industrial purposes. In answer to a request from the Superintendent, specimens of flax straw, retted and unretted, and flax fibre were sent to the Museum of fibre plants in connection with the Forests Products Laboratory at McGill University, Montreal. There were several other inquiries about flax and requests for samples. One was from a firm in England through their Montreal agents, who wished to test samples of Canadian-grown flax straw, and who stated that, if found suitable for the purpose, they could use very large quantities of it. Two bales, each weighing about 110 pounds, of flax straw grown at Indian Head, Sask., and on the Central Experimental Farm at Ottawa were sent forward, but no report on the quality of the sample has yet been received. There was also a request from a firm in Ireland for samples of both Canadian-grown flax seed and flax straw, both of which were sent. Samples of flax and flax fibre were also

exhibited at the Central Canada Exhibition at Ottawa. Other particulars regarding experiments with flax carried out at the Central Experimental Farm will be found in a separate section below.

The usual work in connection with the Arboretum and Botanical Garden was carried out during the year, and several additional plots were laid out for experiments and observations on weeds and other wild plants, the herbaceous border being kept for more showy species.

An exchange list of seeds of 370 species was sent out to twenty-six of the principal Botanic Gardens of the world, and packets of seeds were sent to the following Botanical Gardens: 27 to Aulnay sur Bois, France; 7 to Trinity College, Dublin, Ireland; 44 to Oxford, England; 6 to New York; 7 to Glasnevin, Dublin, Ireland; 11 to St. Louis, Missouri; 21 to Nancy, France; 17 to Lausanne, Switzerland; 9 to Groningen, Holland; 18 to Lund, Sweden; 2 to East Lansing, Michigan; 36 to Upsala, Sweden.

In return considerable numbers of species were received as follows: 20 from Washington, D. C.; 10 from Brooklyn, N.Y.; 13 from Trinity College, Dublin; 29 from Glasnevin, Ireland; 1 from Ekaterinburg, Russia; 10 from Tiflis, Caucasia; 33 from Nancy, France; 27 from Lausanne, Switzerland. In addition a rooted specimen of *Larix dahurica* Turcz, was received from the Bureau of Plant Industry, Washington, D.C.

During the year Exhibition Circular No. 77 on the "Cultivation of Flax for Fibre" was published, and an illustrated Bulletin No. 28, second series, on "Flax for Fibre, its Cultivation and Handling," was prepared.

Experiments with Hemp.—A small plot measuring 1/269 of an acre in extent was sown on May 12, 1915, with seed obtained from the Bureau of Plant Industry, Washington, D.C. It was sown at the rate of 33 pounds per acre. On August 30 the average height of the crop was 5 feet, the tallest being 6½ feet. The early part of the season had been dry and this doubtless affected the growth to a considerable extent. It was pulled on August 30, when the pollen was being shed, and retted by floating on the surface of water. It was sent after drying to the Doon Twine Mills, Ontario, for report. The reply received was as follows:—

"The fibre in this hemp seems to be of very good quality, but we think it has been pretty badly spoiled in the retting. It is not extra long hemp but the quality of the fibre is better than if it had been long. We could use any amount of this class of straw properly retted. We think in southern Ontario it would grow a great deal better than on your Farm in Ottawa."

Some of the same sample of seed was sown on May 31, 1915, to see whether it would be possible to ripen the seeds in this latitude. Several plants in which the first seeds were ripe were cut between October 22 and 29 and allowed to dry. The last plants were cut on November 11, and when threshed yielded a considerable number of well-ripened seeds. When cleaned and tested they gave a germination of 90 per cent. The crop successfully withstood a temperature of 25 degrees F. on October 25.

Experiments with Flax.—During the year 1915 several plots of flax for fibre were grown at the Central Experimental Farm. Two brands of seed were used, namely, Dutch-Riga-Child, imported direct from Holland, by special arrangement between the Dominion Botanist and Dr. Ritzema-Bos, and Canadian-grown seed purchased in Ottawa. The Dutch seed when tested gave a germination of 73·5 per cent and the Canadian seed a germination of 100 per cent. The plots sown were of two sizes, namely, one-fortieth acre and one-eightieth acre, and the seed was sown on various dates between the 10th and 25th of May. The rate of sowing varied between 1¼ and 3 bushels per acre. The average height of four plots grown from Dutch seed was 28½ inches, and the average height of five plots from Canadian seed was 21½ inches. The plots were pulled for the most part at three dif-

ferent stages of ripeness; in some cases the capsules were fully formed but none of the seeds were ripe; in others the first capsule on each plant was ripe while in the third series about half the capsules were ripe. The latest-sown plot became badly affected with flax-rust. Some plots were stooked to dry and the capsules were removed subsequently by rippling; in other cases the capsules were removed and the flax was retted directly, the capsules being spread on a cloth and allowed to dry. The capsules in both cases were subsequently crushed and the seeds separated and cleaned. An estimate of the quantity of seed was made in the case of four plots of Dutch flax and these yielded 6, 5, 4½, and 7¼ bushels per acre, 56 pounds being taken to the bushel.

After pulling, the flax was retted in water. For this purpose four ponds, each about 3 feet deep were dug in a corner of the Botanical Garden near the Rideau canal, and filled with water. This water, on analysis by Dr. Shutt, gave 9·03 degrees of hardness on Clark's scale. It was found that there was a difference of 12° F. between the temperature of the water at the bottom and that at the surface on warm days, and in consequence of this difference, the bundles of flax were floated on the surface and kept under water by the aid of planks weighted with stones (Plate LIX). In order to ret uniformly, the water surrounding the bundle should all be approximately at the same temperature. The surface temperature on certain days rose as high as 80° F.; later in the season, when other samples of flax not grown on the Central Experimental Farm were being retted, the temperature was as low as 47° F., a figure which is not calculated to give satisfactory results. The time taken for retting varied with the season of the year. During warm weather some samples were taken out after 2¾ days' immersion, while later on when the weather was becoming colder nine days were required.

It was found that some of the samples were a little under-retted. The time taken for retting appeared to vary somewhat with the age of the flax when pulled, the subsequent drying of the flax before retting, the thickness of the flax stems, which again depends on the rate of seeding, the temperature and the hardness of the water employed, and the degree of tightness of the bundles. If the flax bundle is tied tightly the central part rets more slowly than the outside and presumably a large bundle would require longer time for retting than a small bundle.

The tanks used for retting were pumped out several times during the season and filled again with clean water.

It is not advisable to ret flax after the middle of September in this climate if the best results are to be obtained.

After being taken from the dam the flax was spread in thin layers on the grass to dry (Plate LX foreground). The spreading on the grass has the effect of carrying on somewhat further the process of retting and at the same time improves the colour. The time that flax should be allowed to remain on the grass must be largely determined by the condition of the flax and by the nature of the weather. If it is slightly under-retted when taken from the water the effect of "grassing" will be to complete the retting process. If the weather is showery over-retting may result, or it may be difficult to get it properly dried. Sometimes it is necessary to set the flax straw up on end to get it dried, the process being known as "wigwaming" or "steepling" (Plate LX).

The time occupied on the grass by different samples varied between one and seventeen days. When properly dried, the retted straw was kept under cover and was afterwards sent to the scutch mill to be reported on. Some samples were scutched at Forest, Ont., but the greater number were sent to the mill of the Ontario Flax Co., Ltd., Parkhill, Ont. The manager of this mill, who represents the York St. Flax Spinning Co., of Belfast, Ireland, and who has a large experience in handling flax fibre, kindly reported on the comparative value of the samples submitted to him. For this purpose he divided them into the following six classes:—

No. I. This is a well grown flax, with sound fibre suitable for warp spinning. Would compare favourably with Irish flax.

No. II. Not as long a flax as No. 1, but as suitable in every other way.

No. III. Strong hard flax not as well retted as first two numbers.

No. IV. Short, scrubby, under-retted.

No. V. Short, poor fibre, under-retted.

No. VI. Short, with no value for fibre.

Of the samples grown on the Central Experimental Farm none were placed in class I. One grown from Dutch seed was placed in class II. Three from Dutch seed and two grown from Canadian seed were placed in class III, and three grown from Canadian seed were placed in class IV.

In addition to the samples of flax grown on the Central Experimental Farm, various others from different parts of Canada were retted and afterwards scutched at Parkhill. Fourteen were received from the following places in southwestern Ontario: Floradale, Conestogo, Dashwood, Zurich, Exeter, Wingham, Ripley, Hensall, Crediton, Forest, Parkhill, Oilsprings. These were grown chiefly for their fibre, some being Blue Blossom and others White Blossom varieties. The seed was obtained originally from Holland, Belgium or Russia. The samples varied in length from 2 to 3 feet and in most of them the bulk of the seeds was ripe. Of these samples eight were placed in class I four in class II, and two in class III.

In addition to the foregoing, fifty-four samples were sent in by the Superintendents of the Branch Farms. One of these was from Lacombe, Alta.; 9 from Lethbridge, Alta.; 3 from Rosthern, Sask.; 17 from Indian Head. Sask.; 10 from Scott, Sask.; 9 from Morden, Man.; 4 from Brandon, Man., and 1 from Ground Hog River Experimental Farm in northern Ontario. Nine of the samples from Indian Head were grown expressly for fibre, being sown on different dates and on different classes of land. The others appeared to have been sown for seed-production only. One sample had been cut while all the others were pulled. The length of the pulled samples varied between 11½ and 36 inches. As is usual in flax grown for seed, the stems, in a large number of cases, were branched near the base.

After scutching, these samples were classed as follows: Class I, none; class II, 2; class III, 15; class IV, 16; class V, 14; class VI, 7. The two best samples were grown at Lethbridge.

Sixteen samples belonging to two varieties, Novelty and Longstem, were retted for Dr. C. E. Saunders, Dominion Cerealist. These were grown on the Experimental Farms at the following places: Fredericton, N.B., Ste. Anne de la Pocatière, Que., Cap Rouge, Que., Indian Head, Sask., Rosthern, Sask., Lacombe, Alta., Lethbridge, Alta., Agassiz, B.C. The variety Novelty varied in length between 18 and 30 inches, and Longstem between 24 and 41 inches. These were also scutched at Parkhill and were valued as follows: 2 in class I, 3 in class III, 5 in class IV, 3 in class V, 3 in class VI. The two best samples were both grown at Agassiz, B.C.

Some miscellaneous observations were made, during the year, the more important of which are given below:—

A plot of flax was left growing in order to see whether it was possible to ripen all the seeds. The latter part of the season was very wet and as a result of this it was found that as late as the 1st of October there were still some plants bearing some green unripe capsules.

In order to determine whether flax flowers are self-pollinated, five unopened flowers were enclosed in fine meshwork bags. The weather was very wet for some time afterwards but yet three of the flowers developed full-sized capsules. The pollen grains when placed in water swell up and burst. It would therefore appear that a period of rainy weather is unfavourable to the formation of seeds and that it should be comparatively easy to keep a particular variety pure.

OTTAWA.

A plot of flax grown from Canadian seed was pulled when the first capsule on each plant was ripe. This when reported on at Parkhill was valued as class III. Some more flax from the same plot was pulled twenty-four days later, when about nine-tenths of the capsules were ripe and this was valued as class V.

Seeds obtained from a crop of flax in which only some of the capsules were ripe at the time of pulling were weighed and compared with those taken from a crop with seeds better ripened. In the former case 100 seeds weighed 387 milligrams, while in the latter 100 seeds weighed 425 milligrams. A milligram is equal to $\frac{1}{453603}$ of a pound. The seed in both cases was the same and was Dutch-Riga-Child. It is scarcely possible at present to say whether large or medium-sized seeds will give the better quality of fibre but it seems probable that the seeds from a fully ripened crop would germinate more uniformly when sown and presumably would give a more uniform crop.

For the purpose of finding out what change, if any, took place in the fibres as they grew older, sections were made of younger and older stems and microchemical tests were applied. Both aniline hydrochloride and phloroglucin showed that even in comparatively young stems a certain amount of lignification took place and, as might have been expected, this was rather more pronounced in the older stems. It is not possible to say yet whether there are any varieties of flax in which no lignification of the fibres occurs but if there are it would seem desirable to select such varieties for the best class of fibre.

In order to determine the percentage of fibre to retted straw more accurately than by the ordinary commercial methods of scutching small samples of retted flax from different localities were weighed on a chemical balance and the fibre obtained by scutching them between the fingers was determined in the same way. The samples of flax tested in this way were as follows:—

PB Seed of Canadian origin. Plot grown on Central Experimental Farm, Ottawa.

PC Same as PB.

IH_1 Seed of Canadian origin. Crop grown at Indian Head, Sask.

C Seed imported from Holland. Crop grown at Ottawa.

IH_2 Same as IH_1.

OF_2 Seed grown in Canada. Crop grown at Conestogo, Ont.

EF_{13} Seed of Canadian origin. Crop grown at Lethbridge, Alta.

S_{11} Seed grown in Canada. Crop grown at Agassiz, B.C.

Five thick and five slender stalks were taken from the same bundle in each case and the average diameter of each stalk half way up was measured. In the case of PB, PC, IH, and C the roots and branching tops were included while in IH_2, OF_2, EF_{13}, and S_{11} the roots and branches were cut off before weighing.

—	Thick stems, average diameter in millimetres.	Per cent of fibre.	Thin stems, average diameter in millimetres.	Per cent of fibre.
PB	2·1	18·24	1·1	23·75
PC	1·8	20·25	1·1	26·23
IH_1	1·8	19·64	1·1	19·23
C	2·4	24·63	1·8	26·38
IH_2	1·7	23·67	1·0	27·45
OF_2	2·2	28·14	1·4	33·33
EF_{13}	2·9	22·96	1·9	29·20
S_{11}	2·2	26·03	1·6	28·34
Average	2·1	22·94	1·4	26·74

A millimetre is equal to about one twenty-fifth of an inch.

From a study of the above figures the inference seems reasonable that a fairly thick rate of seeding which will produce more slender stems, will give a larger amount of fibre per acre than a thinner rate of seeding which will produce fewer but thicker stems. This is on the assumption that the crop in both cases attains the same height.

It appears to be somewhat generally believed that early sowing of flax is not desirable owing to the danger of its being killed by frost. There is, however no foundation for this belief. After the flax was pulled considerable numbers of seeds were scattered in some plots and large numbers of seedlings resulted. Almost every stage of development was represented from plants an inch high or less with cotyledons to specimens a foot high. On the 25th of October, 1915, the temperature fell to 25° F. in the shade, but no injury resulted. On the 17th of November a shade temperature of 17° F. was reached and still the flax plants survived. On the 20th November the temperature fell to 14° F., after which some plants 9 inches high were still green. It may therefore be assumed that flax can safely be sown in spring as soon as the ground can be got into proper working order.

Wild Rice (Plate LXI).—Every year we keep receiving inquiries concerning the sources of supply in Canada of germinable wild rice. Correspondents nearly always relate that any attempt to grow purchased seed resulted in failure. Government fish hatcheries also applied for information on the growing of wild rice. It is evident from the inquiries received that the wild rice is intended to serve the purpose of protection and food for fish and fowl. Wild rice is an annual plant which produces a large hard seed about ¾ of an inch long and 1/16 inch broad. This seed is collected by the Indians, and no doubt by the white population who have discovered its culinary uses and become accustomed to it; it is generally roasted on hot stones, broken up and prepared by cooking it like Chinese rice or by using it in the same way as oatmeal porridge. It tastes decidedly grassy, which taste is much removed by soaking the wild rice over night in water and changing same for slightly salted water for cooking.

The difficulty has always been to get this plant established where it does not grow wild. The seed is difficult to obtain viable. All the samples procured from dealers, that we have tested, were found to be dead. We therefore tried experiments for a number of years relating to the storing of wild rice seed over winter in such a manner that it

would retain its life. This result has now been very satisfactorily attained. The rice seed is harvested, emptied into a bag partly immersed in water and is kept in a barrel filled with water until about November, it is then placed in a box and buried outside in the ground, not necessarily near a pond or river, but almost any convenient place. Freezing solid of the whole bulk does not affect the germinating power so long as the seed is covered by about 6 inches of soil. In spring the seed gave nearly 100 per cent germination.

It should either be sown directly after harvest, by scattering it close to the banks of ponds or rivers where it is wanted, or early in spring when seed may be shipped mixed with damp moss. Wild rice does not grow in swift waters, nor where there is no soil bottom, as in glacial streams, for instance. The young plants should be protected the first year from rats and birds, or the seeds will all be eaten off before they are ripe; and, being an annual plant, it will not come up again next year unless new seed is sown. It produces an abundance of seed, and will be quite permanent once it is afforded a fair chance.

IV. REPORT FROM THE FIELD LABORATORY OF PLANT PATHOLOGY, ST. CATHARINES, ONT.

(W. A. McCubbin, M.A., *Assistant in Charge.*)

In addition to the experiments and surveys carried on during the year in connection with various diseases, of which the White Pine Blister Rust may be noted as receiving a large amount of attention (*vide* section I, Destructive Insect and Pest Act), a few other features of the work deserve mention.

During the winter months a series of twelve addresses illustrated by lantern slides was given to agricultural classes throughout the province on the subject of plant diseases, and some eight other addresses on various disease topics were also delivered at various times throughout the year.

The inspection at Niagara Falls of seed potatoes imported from the United States occupied a great deal of time in the spring months, and both field and crop inspections of potatoes were made during the year for various members of the Canadian Seed Growers' Association.

Inquiries for information on diseases are yearly increasing in number, and are becoming a prominent feature of the work of this laboratory.

General Conditions in 1915.—The winter of 1914-15 was very favourable from the standpoint of the fruit-grower, and few cases of winter injury occurred throughout the Niagara district. The spring opened up somewhat earlier than usual and the cold period which followed in April and May retarded the early planting of many crops, especially of tomatoes. On May 27 there was a severe frost which greatly damaged many of the early crops in the province, and which was particularly severe on the early tomatoes. Injury from this late frost was comparatively light in the Niagara region, but elsewhere considerable damage was done.

The summer was generally characterized by an excessive amount of rainfall, and the frequent showers which came at short intervals kept the soil much too full of water until September. Owing to the abnormally wet conditions, several diseases became epidemic, among which the Late Blight of potatoes deserves first mention, as it was almost universal in Ontario, and very disastrous in some localities. Brown Rot of stone fruits, Leaf Spot of plum and cherries, and Apple Scab, were also more prevalent than usual. In addition, a large number of plants of various kinds either died or were badly injured because of the rotting of their rootlets in the water-logged soil. Potatoes, tomatoes, and beans suffered heavily in this way, but the same sort of injury was not infrequent in fruit trees, particularly in cherries.

Drier weather conditions prevailed during the autumn months, and this, in conjunction with a long and gradual fall in the temperature to winter conditions, sent the tender fruits into the dormant state under very favourable circumstances.

Squirrel-Scars on Maple Limbs.—The limbs of the sugar maple (*Acer saccharum* Marsh.), have many times been noted by the writer to be covered with scars, particularly on their upper surfaces. The injury is most common on the lower branches, especially if these project more or less horizontally from the trunk, and is usually to be seen in trees growing along fences or on the edges of woods. On such trees, limbs may often be seen which have the whole of their upper surfaces covered with innumerable lumpy distorted swellings, as if countless wounds had been made in them from above. The individual wounds which bring about this appearance are evidently made at different times, since they show various stages of the healing process. Some are entirely healed over, while others are of very recent origin. All of them, however, show a characteristic darkening of the wood below the point of injury, thus indicating that the cambium must have been affected by the wounding. These discoloured areas are not extensive either in surface or depth, and there is often a bluish-green tinge associated with the normally very dark appearance of the tissue. In a number of cases where the wounds still remained open, a small fungus, apparently belonging to the genus *Ceratostoma,* was present on the exposed wood, and it is perhaps the action of this fungus on the tissue before the wound has healed over that brings about the peculiar discoloration noted.

The actual cause of these wounds was somewhat of a puzzle to the writer until in April, 1915, several trees were seen which bore unmistakeable evidence of the fact that such injuries are due to the bites of the common red squirrel. In trying to find as recent a wound as possible, it was noted that, in the earlier stages, the scars left were always in pairs, which naturally suggested the work of some animal. After a search a tree was found on which the actual teeth marks only a few days old were to be seen, and it may be noted that these were all on limbs which bore already the scars of many such injuries in previous years. A close examination of these marks was made, and from the nature of the wound, its size, depth and position, there could be no doubt that it was due to the animal in question, probably in an endeavour to obtain sap. This tree was examined on April 21, and the injury probably took place about the 18th, at the time when the maple sap was still running freely, so that it is reasonable to suppose that the squirrel was after sap.

In making the wound the teeth are sunk deeply into the limb, sometimes so far that they gouge a piece from the wood or break the bark away from the cambium. The piece so loosened dies, and an open wound is left. In other cases only the upper teeth are deeply sunk, the lower ones merely injuring the cortex, leaving a small superficial cicatrix. After a year's growth this cicatrix is almost lost sight of in the roughened swelling arising from the wound made by the upper teeth, and the third year it disappears altogether.

Defoliation of Sycamore.—In a former report (1914-15) the fungus *Gloeosporium nervisequum* (Fckl.) Sacc. was noted as damaging the leaves of oak trees. During the recent spring the same, or a very similar fungus, was responsible for the defoliation of large numbers of our native sycamore or buttonwood (*Platanus occidentalis* L.) The injury took place when the leaves were unfolding, and was so severe in many cases that not only was every leaf on the tree destroyed, but a great many twigs were killed as well. Such trees later on put out new leaves and seemed to suffer very little further damage throughout the rest of the summer. It is to be noted that the second set of leaves was somewhat smaller than normal, and also fewer in number, but otherwise the trees remained perfectly healthy and vigorous all year.

In leaves which have been killed in this way there can usually be seen rows of little black spore pustules (*pycnidia*) set closely along the midrib and veins. Similar

minute spore pustules are to be found on the twigs, which are killed by it, but in this case they are scattered irregularly over the surface.

There is no record of the prevalence of this disease in former years, but, judging from the destruction of the terminal growth of limbs during the present year, its frequent recurrence would, perhaps, partially account for the ragged, crooked growth of many of our sycamore trees. It is noteworthy, also, that there was a possibility of initial injury of these leaves and twigs by the late frost of May 27, which might have rendered them especially susceptible to the attacks of the fungus.

A cherry fruit spot due to frost.—During the sour-cherry season a number of cherries were noted in various places in which small, brown, dead spots were present in the flesh. No fungus could be obtained by cultures from these spots, and they did not increase in size in storage. It is thought that they are a rather unusual result of the late spring frost of May 27. Many plums and cherries were killed outright by this frost throughout the province, and many others were so injured that irregular, one-sided development resulted. Several of the latter were found on the trees which bore the spotted fruit, as well as other stages intermediate between this more pronounced injury and the spots in question. As these spotted fruits were all found on trees in the Niagara peninsula, where the frost was comparatively light, it is not impossible that small areas of tissue might have been destroyed in these fruits without causing enough injury to prevent subsequent development; so that the mature fruit was normal in every way except for small islands of brown tissue in the flesh.

Cherry: Injury due to wet soil.—During the month of August a large number of young sweet and sour cherry trees (especially the latter) died out, under conditions that strongly suggest root trouble of some kind. Either the whole top suddenly wilted and died, with the leaves remaining on the trees, or else there was a marked casting of the leaves extending over a considerable period. In some cases the leaf fall was directly traceable to the work of the Shot-hole fungus, which was exceedingly plentiful this year, but in a number of others there was not enough of the fungus present to account for the excessive dropping of the foliage. There is good reason to think that these defoliated trees have all suffered more or less from the same cause which has been responsible for the death of those which have wilted suddenly, viz., wet soil. Numbers of trees in both conditions have been examined, and it is found that they all exhibit the same symptom, though in varying degrees. When the roots of such trees are dug up the larger roots are seen to have a water-soaked appearance, while the smaller roots and rootlets are quite brown and completely rotted. The trunks on the other hand are much drier than normal and are often discoloured.

In the case of the trees which die suddenly there is no doubt that the excess of water in the soil is the factor concerned. The rotting away of the innumerable little rootlets greatly reduces the water-absorbing power of the root, for it must be remembered that the larger roots are covered with a thick and corky bark through which water can scarcely pass. It would perhaps be fair to say that by the loss of these rootlets the power of the plant to absorb water drops to a quarter of what it ought to be. Aside from this lack of absorbing power there is also another factor in cases of wet feet that hastens the death of the tree. The rotting of the roots produces certain substances which, when carried up in the sap, poison the tissues and clog the sap-conducting tubes in the stem, so that even the small amount of water that is absorbed moves up to the top with great difficulty. In such cases, therefore, the top of the tree is suffering from lack of water although there is plenty of it in the soil.

The wilting of the leaves in extreme cases is very good evidence that the state of affairs outlined above actually exists in the roots. In the milder cases, where the roots are only partially destroyed, sufficient water passes up the stem to prevent

wilting, but not enough for the normal needs of the plant, so that the top lives in a state of drought. The casting of leaves is always a symptom strongly suspicious of drought conditions, when there is no other factor to account for it, so that it is only reasonable to think that unfavourable root conditions may be partially responsible for the excessive leaf-fall of these cherry trees. There is no doubt that the Shot-hole fungus can attack the leaves on a weakened tree much more readily than on a healthy one, and this may also help to explain the prevalence of this disease during the present season.

Winter-killing of Strawberry Roots.—A considerable amount of loss was caused to strawberry growers during the year just ended by what has been popularly called "Root Rot," but which was really a killing of the roots by heavy frosts in spring after the early mild weather had started the plants to grow. Very few of the affected plants showed any signs of the injury at the time. While the spring moisture was plentiful, they leafed out well and set fruit abundantly, but later on, when drier conditions followed, they began to shrivel up and die. The weakest and worst injured plants died before ripening any fruit, but the greatest number lived on till midsummer and then dropped off all through the picking season. Many others, which were only slightly affected, recovered, but too late to save their fruit, which was undersized and scanty. Although there was no scarcity of moisture throughout the summer, the appearance of some of these fields at picking time strongly suggested the effects of a severe drought. The earlier-formed leaves were mostly dead and the later ones were small and their tips and edges were badly sunburned.

When the roots of such plants were examined, it was found that they were brown, shrivelled and more or less brittle and rotten. In some cases, the characteristic brown discoloration extended into the crown, especially if it was set low in the earth. It should be noted here that browning of the roots externally is quite a normal condition for the strawberry as well as for other plants. When the root is first formed it is white and glistening on the outside; at the end of the first year, however, the outer part browns and dies, but there is left within a small core of white, living tissue. When such a root is pulled apart lengthwise, this centre comes out as a small, white cord. In the frozen roots this core is quite brown, and in later stages it becomes so brittle that the roots will not stand pulling from the ground. Any determination of root killing should, therefore, be based, not on the brown outward appearance, but on the condition of the living central part.

Although this injury reduced a great many crops from a quarter to a third below their normal yield, it is encouraging to note that, towards the end of the summer, most of these fields recovered to a great extent. Runners filled in the gaps and the slightly injured plants started into vigorous growth again so that by fall the fields presented almost a normal appearance.

It should be mentioned that, in some cases, additional loss resulted from the use of sets from these fields. Although it was not noticed at the time they were transplanted, their roots were also injured, and the newly-set field was a failure. It would be wise when planting out a field in spring to take the precaution of looking at enough of the roots of the sets to make sure that they are still sound. The differences pointed out above between healthy and frozen roots will enable any one to do this readily.

Strawberry Mildew (Sphœrotheca humuli DC..)—The unusually wet weather of the early part of the summer induced a very severe attack of this fungus on strawberry leaves. It is a well-known fungus but it is only occasionally abundant enough to be important, the last epidemic in this district having occurred in 1908.

The fungus appears mainly on the under sides of the leaves where it may be seen as a white, downy coating. When it is present in quantity in a field, the leaves become

perceptibly lighter in colour and curl up at the edges. In most cases, the action of the sunlight on the upturned under surfaces turns the normal colour into a pronounced reddish or purplish tint, quite noticeable in looking over the field even from a distance. Later on, many of the edges and tips of the leaves die, which makes the whole field look unhealthy. The curling up of the leaves is decidedly bad for the crop as it uncovers the young fruit to the sun. Such fruit, instead of developing as it normally should, under the shady moisture of a thick layer of leaves, is exposed to the dryness and heat, and a crop of poor, small fruit is all that ripens.

With the advent of dry and hot weather, the epidemic of this mildew suddenly ceased, but, in many cases, the after effects noted above followed in due course, although nearly all traces of the fungus itself soon disappeared.

From experiments carried on by Mr. F. M. Clement, of the Vineland Horticultural Experiment Station, ordinary sulphur dusted along the rows seemed to have a beneficial effect though the applications were made too near the end of the epidemic to give any striking difference between the dusted and the untreated rows.

A ripe rot of fruits due to Rhizopus nigricans Ehr.—This fungus has been frequently met with on fallen peaches and pears in the orchard, and occasionally in basketed fruit. In order to determine whether it was actually the cause of the rot in these cases or was only of secondary importance, several inoculations were made with a pure culture of the fungus. In every case a deep and rapid rot followed. In pears, the spot produced had a water-soaked appearance outwardly and the tissue within was soft and wet, but not deeply discoloured. In peaches, the spot soon became very black, and the rotted tissue within became very tough from the matting of the hyphal threads.

It is only when ripe that these fruits seem to be susceptible to the attacks of the "Bread Mould" fungus. No rot due to it has ever been met with in green or incompletely ripened fruits.

Heart rot of peach trees.—A considerable percentage of peach trees break down each year during the fruit season because of mechanical weaknesses in the trunk and main limbs. In some cases the weakness is due solely to what might be termed crotch splitting. As every peach grower knows, the peach is peculiarly subject to this splitting, especially if the main limbs are allowed to grow in a narrow rather than a wide "V." Far greater mechanical strength is secured in the tree when the main limbs are trained in early life to start out as nearly at right angles to the trunk as possible. To some extent this is a matter of variety, but a great deal can be done in the first few years of growth if pruning operations take into consideration the attainment of mechanical strength in the adult tree.

This weakening of the tree by a split in the crotch is in itself sufficiently serious to be worth attention in the young orchard, but such weaknesses are, in a great majority of cases, increased many fold by the action of fungi which gain entrance through the split and cause a rot of the heart wood within. Very few crotch splits remain free from these fungi for any length of time after they are formed. They can be seen in almost any broken-down limb at the crotch as bits of white felt-like growth on the surface or in the tissue of the wood. The effect of such fungi on the wood can also be readily determined by any one. Ordinary heart wood has usually a clear light-brown colour and is firm and tough. When such wood has been acted on by these fungi, however, it becomes pallid in colour and very soft and brittle in texture. In other words, it ceases to be of any use in supporting the branch and the whole duty of support falls on the thin outer layer of newly-formed wood. In the limbs in which the heart wood is rotted in this way, it can be seen that the supporting strength depends on a thin cylinder of the outer wood, or if put in another way, the limb, as far as its actual strength is concerned, is merely a tube filled with a pithy and useless centre. Now a tube is a very strong mechanical structure, and, as far as the limbs are

concerned, this arrangement seems to be usually adequate, so that round and uninjured limbs rarely break even if rotted at the heart. Where such a branch joins the trunk with a split crotch, on the other hand, all the strength due to the tubular arrangement of the sound wood is lost, for at this point the sound wood consists of a flat band on the lower side of the limb,—a band easily broken by a little extra weight. After a split crotch has been attacked by fungi it is only a matter of time before one of the limbs, or both, will break down from the weakness caused by the rotting of the heart wood at this joint.

Just how long a time is required for this weakening process depends on various things, but from one to three years would probably be a fair estimate.

While the breaking off of branches is the most important phase of the injury caused by these heart rot fungi, a considerable amount of damage results from them in other ways. When infection is plentiful from spores produced on the "shelf fungi" arising from dead parts about the tree, these fungi are apt to infest a great many of the pruning wounds, and may often make their way from these wounds to the heart wood of branches. Cultures recently made from two peach branches adjoining pruned stubs demonstrated that the particular shelf fungus in this case had penetrated into the heart for a distance of about 30 inches. The two branches were three and four years of age at the base, and the fungus had, at the time of examination, reached the base of the last year's growth. Outwardly these branches were healthy, though of somewhat shorter growth than usual. In numbers of orchards, nearly every tree is suffering to some extent from heart rot of this kind, and while the trees may not die outright from the attack, their vitality is lowered and the wood rendered so brittle that branch after branch breaks off at the weak places leaving a mere fragment of what the tree ought to be.

The heart rot in question is apparently due to a number of species of the Polypores, or as they are more popularly called, "Shelf Fungi." It is quite probable that all of these are native with us and could be found in our woods growing on other trees, many of which suffer from heart rots also. These shelf fungi grow as well on dead wood of many kinds, and it is possible that they are only able to attack those parts of our peach trees which are dead, dying, or greatly weakened in some way. There is reason to think that winter injury may make a tree liable to their attack.

It need hardly be said that spraying will have little or no effect in checking heart rot. The fungi causing it live inside the tissues where no spray can reach, and although the "shelves" from which the spores are spread are comparatively few in number, yet each one produces innumerable spores which it sheds continuously for several weeks, so that infection takes place more readily than one would at first think.

It has been suggested elsewhere (Report of Dominion Botanist, 1914-15) that a hopeful means in dealing with peach canker involves careful attention to pruning methods, especially in removing from the tree all dead and dying wood. There is no doubt that the heart rot can be reduced in a similar way, for if all the sources of infection in old dead limbs, tree trunks, pruning stubs, etc., are taken out, the fungi causing the rot will have no place to gain entrance to the trees, and, what is still more important, they will have no chance to spread from to tree. In view of the constant and increasing losses from these wood-destroying fungi, it is probable that a great deal more attention will have to be given in future to the question of cleanliness in pruning than has been the custom in the past.

Purple spotting of Raspberry canes.—This trouble is of frequent occurrence on the canes of the red raspberry, and it has been the subject of many inquiries during the last two years.

The spotting is usually noticed first some time after the middle of the summer, often about the time the old canes are being removed. The new canes are then observed to have a number of purple or reddish-brown spots of varying sizes here and there along

them, but especially on the lower half of the stem. A few minutes' examination will convince one that these spots nearly always arise from around the bases of old dead leaf-stalks, and, if enough spots are examined, all stages in their development can be made out, from the tiny spot around the stalk to the stages where the affected area has become so large that practically all of the stem is covered. In advanced cases the spots arising from the various centres meet each other so that the whole stem for a considerable distance is discoloured. The colour in the early stages is, as already noted, purplish, or purplish-brown, but as time goes on it changes to brownish-grey, owing to the dying of the thin outer skin. Later in the fall or during the next spring the affected parts assume a silvery hue, and, if one looks closely, there may be seen in the whitish areas a number of very minute black specks.

This purple discoloration is due to the work of a small fungus (*Sphaerella rubina* Stewart and Eustace), which comes into the stem by way of the old dead leaf-stalks, and then spreads slowly over the adjoining area just under the thin outer skin. Apparently it does not go very far into the tissues, for if one scratches the surface, normal, green, healthy tissue is always present underneath. That the damage done by this fungus is of a quite superficial nature is also shown by a microscopic study of the stem tissue under these spots. The thin skin already mentioned, which serves as a protection to the plant in the young stages, is replaced at the end of the first year by a somewhat thicker growth of corky material, which arises just underneath the outer skin. The thin outer skin is afterwards partially shed, and may often be seen hanging loosely about the lower parts of the stalks during the second year. When thin sections of the stem are cut through the discoloured areas, it is readily seen that the region affected by the fungus lies entirely outside of the protective layer, and that the formation of this layer has not been interfered with, except that it commences to form a little sooner than in the normal canes. It should also be noted that the buds which have been produced in the axils of the old dead leaf-stalks, and which are in the middle of the affected area, are usually quite sound and green within.

From the above considerations it is apparent that the actual damage done by this fungus on the canes is so small that no anxiety need be caused by its presence. Experience shows that canes that might have been badly affected by the spotting during the first year, are quite healthy and vigorous the year after, and while there may be isolated cases where canes are girdled or buds destroyed, such cases are too few to be of any importance.

The small black pimples with which the silvered areas are studded during the spring of the second year are the spore-bearing organs of the fungus, and from them the spores spread in early summer to the young growth. Since these spores are produced on vigorous canes which are about to fruit, the cutting out and burning of canes, which is such a useful means of keeping the raspberry field free from a number of other troubles, would not help in this case, for the diseased canes could not be removed till after the crop had been taken off, long after the infection had passed on to the new growth. Neither would spraying be likely to control the disease satisfactorily, since the fungus lives under the bark and from this protected position sends its spores to the new growth for a considerable part of the summer. Only a series of sprayings to protect the young growth during this period of spore production would insure freedom from infection, and it is doubtful if even this method would give adequate protection.

It is rather fortunate that the injury done by this fungus is of a comparatively trivial nature, for if it was so damaging that control measures would become necessary, as in the case of Raspberry Cane Blight, it might give a great deal of trouble.

ST. CATHARINES.

Mosaic Disease of Tomato.—In the report of the Dominion Botanist for 1914-15 a few observations on this disease were recorded, and an approximate estimate of the prevalence of the disease was made, according to which fifteen fields were found to be affected out of sixty-one examined—about 26 per cent.

Later on, it was seen that a more accurate result would be obtained by estimating the percentage of mosaic plants without reference to the fields, which vary so much in size that the mere tabulation of the presence or absence of the disease is of little help in estimating the amount of mosaic present generally throughout the whole district. Accordingly, a survey of some 26 fields was made in 1915 in order to obtain data for computing the general prevalence of the disease. The results are given in table form below:—

Number.	Date.	Plants examined.	Plants diseased.	Percentage of disease.
1	July 13	220	2	0·96
2	" 14	200	0	0·00
3	" 14	53	0	0·00
4	" 14	200	0	0·00
5	Aug. 2	300	1	0·33
6	" 2	200	0	0·00
7	" 2	600	0	0·00
8	" 2	400	6	1·50
9	" 2	400	1	0·25
10	" 2	400	0	0·00
11	" 2	200	54	27·00
12	" 6	400	1	0·25
13	" 6	500	0	0·00
14	" 6	400	0	0·00
15	" 6	500	1	0·20
16	" 6	600	0	0·00
17	" 6	400	11	2·75
18	" 9	400	0	0·00
19	" 9	160	0	0·00
20	" 9	280	0	0·00
21	" 9	90	50	55·55
22	" 9	180	1	0·55
23	" 9	200	0	0·00
24	" 10	600	0	0·00
25	" 10	200	0	0·00
26	" 10	500	0	0·00
Totals		8,583	128	

	Per cent.
Percentage of fields affected	40
Actual percentage of diseased plants found	1·49
Average percentage of all the fields	3·43
Average of all but two worst fields	0·28

In the above table it will be noted that two of the fields showed an amount of disease far in excess of any of the others. The wide gap which separates these two from the rest—a gap unfilled by intermediate stages—suggests the existence of an additional causal factor in these cases. It is almost certain that this factor is seed bed infection. In No. 11, where 27 per cent of the field was affected, the plants were started in greenhouse flats and later transplanted to a cold frame. The earth in this cold frame was the same as that used for the previous year, with the addition of fresh material, so that there was ample opportunity for infection to be carried over in the soil. While no information is available regarding the early stages of the plants in No.

21, where 55·55 per cent of infection occurred, yet it is very likely that the grower, who raised large numbers of plants for sale, also followed the usual practice of using the earth left over from the preceding year.

As pointed out in the notes previously written (Report Dominion Botanist, 1914-15), there is often present in connection with this disease a strong indication of seed-bed infection: the occurrence of the diseased plants definitely in rows or parts of rows. It is hard to explain why the disease should occur in this way if its presence is due to field or soil infection. In field infection especially, which has been attributed to the successive contacts of cultivating implements, etc., with diseased and healthy plants, one could not look for uniformity of this kind. Since the plants are usually placed in a square, 4 by 4 feet, and cultivation is given equally in both directions, it is fair to assume that any infection resulting from this cultivation would also be equal in both directions. Such is not the case, however; the lines of infection are clearly along the rows as they were planted out. A test has often been made of this point by determining from the arrangement of the diseased plants in which direction planting took place, and then having the owner verify the determination. Such determinations have never failed to be correct.

Since in the two fields in question this consecutive arrangement of the diseased plants was very strongly evident, the writer is convinced that the wholesale infection of the plants in the seed bed has been responsible for the excessive amount of disease noted. Loss in this way is obviously preventible by renewing the earth of the bed each year, or at least changing it as soon as mosaic appears in plants taken from it. Several men who have practised this method report that the disease can be quickly got under control in this way.

If the disease in these two fields can be considered preventible by the clean seed bed, then the remaining fields in the table can be taken to represent the general amount of disease arising from various other causes. On this basis the percentage of diseased plants in the remaining twenty-four fields falls at once to 0·28 per cent, or about 1 plant in 400. It is probable that considerable yearly variation will occur, but the figures in the above table may fairly be taken to represent the prevalence of mosaic in the Niagara peninsula for this season (1915).

Throughout the course of the above survey, records were kept of the nature of the soil, the source of the plants, and of the crop which preceded the present planting of tomatoes. On tabulation, these records proved to be so variable that they throw no light on the part played by any of the three factors mentioned, in the origin, yearly recurrence and spread of the disease.

Do mosaic plants yield as heavily as healthy ones? All the evidence seems to indicate that on the whole they do not. When the plant is attacked late in the season the difference in the crop is not readily seen, and may in many cases be small; but the fact that badly attacked fields show unmistakeably a marked lessening in crop would suggest that the same feature is likely to obtain in less pronounced cases, though the diminution may not be apparent to ordinary observation. Since the diseased plants are scattered through the field and the picking is done indiscriminately, it is doubtful if any diminution in the crop not greater than 10 per cent would be discernible under ordinary field conditions. In many of the badly diseased fields seen here the lessening of the crop was quite obvious, and in two or three of these the owners estimated their losses to be one-third to one-half the crop.

Actual evidence on this point has been supplied through the kindness of Mr. F. M. Clement, Director of the Vineland Experiment Station. who undertook to ascertain the weight of the crop from a certain number of diseased plants, and of that from the same number of healthy plants, all from the same field. The results are very striking, for while in the field in question one might after careful observation conclude that there was some small difference in the yield from the healthy and

mosaic plants, yet this difference would appear so small that it would be estimated at far below the figures which were obtained by actually counting and weighing the fruit. The table below is from Mr. Clement's records:—

Variety.	No. of plants.	Fruits from			
		Healthy plants		Mosaic plants	
		No.	Weight.	No.	Weight.
Danish Export	49	6,659	681	4,740	479½
Ponderosa	4	219	59	120	50½
Chalk's Early Jewel	6	257	79½	216	69
Totals	59	7,135	819½	5,076	599

Increase in healthy over mosaic plants in number of fruits..... 36·8%
" " " weight of fruits..... 40·5%

In addition to the field observations already recorded, another experiment on this disease was begun. It has often occurred to the writer, in the course of making notes on this affection, that some light might be thrown on the general question of mosaic diseases by growing a diseased plant for a number of generations vegetatively, i.e., by cuttings. These could be grown in as many different soils, and under as many diverse conditions as might be found necessary, and there is a possibility of obtaining valuable additions to our knowledge by a close study of the behaviour of these succeeding generations.

Of all the plants known to the writer to be affected by mosaic troubles, the tomato is perhaps the one which will grow most easily from cuttings, and for this reason it was selected for a preliminary study of this phase of the question.

A tomato plant will grow very well for a long time in a box or a deep flat, and if, after growing towards the light for several days, its position is reversed, it will then grow towards the light again and the stems will form a bow. This bow may then be covered with earth in an adjoining flat, and roots will start out from the underground part of the stem. If the soil in the parent flat is kept somewhat drier than that in the second flat, it will help to induce root formation. It is also advisable to cut partly through the stem between the two flats, or better still, to girdle it, for then the accumulation of food material in the distal part of the stem is a strong stimulation to root production. When the new cutting is well started the connecting stem is totally severed, and the fresh plant thus obtained will grow almost as well as one raised from seed.

Owing to very inadequate greenhouse arrangements, the series that was started in this way did not grow as quickly as desirable, but six generations were secured which lasted for a period of over two years. With greenhouse facilities adapted to this work, there is no doubt that the same number of generations could be produced in about half the time. The plants used were grown in the window of the laboratory, and though they throve in the summer months when heat and light were adequate, it was with the greatest difficulty that they could be kept alive during the dark winter days.

In this preliminary attempt, no variations in the soil were tried out, although the new plants were always started in fresh earth. The original plant was grown from seed and when about a foot high was inoculated with the sap of a mosaic plant from a commercial greenhouse. As growth proceeded it developed very marked mosaic symptoms.

Although the six generations arising from this plant all showed signs of the disease, none of them was so badly affected as the parent plant, and in some cases,

especially among the last of the generations, the presence of the disease could be determined with difficulty. So slight was the evidence in these plants that, had they been met with in the field, they would have been passed over as healthy plants. Still the disease was never entirely absent, and even the diminution noted may have been partly due to unfavourable weather conditions.

While the results so far obtained have presented no new or important features, it is hoped that the extended work now to be undertaken will yield something of value to the subject.

V. REPORT FROM THE FIELD LABORATORY OF PLANT PATHOLOGY, CHARLOTTETOWN, P.E.I.

PAUL A. MURPHY, B.A., A.R.C.Sc.I., *Assistant in Charge.*

On the inception of the work in this province on July 5, 1915, the season was well advanced and little opportunity was left for conducting experimental work. There was, besides, urgent necessity for the assistant in charge to look around and familiarize himself with the country and the problems which it presented. Every opportunity was taken of attending farmers' picnics and other gatherings and of addressing those present and discussing plant diseases with them. During the first week two meetings were addressed, and thereafter a point was made of being present at all the picnics of farmers which were held on the Experimental Station grounds. A great deal of valuable information was gained in this way and the officer in charge was enabled to decide along what lines experimental work could most profitably be done. Before the end of July it had become clear that the outstanding problems presented were misses in the potato crop, the Late Blight and Rot of potatoes, Club Root of turnips, and the smuts of the grain crops. Although for some of these the season was becoming late, it was decided to begin experiments at once in the hope of being able to obtain results. The experiments are detailed below, in so far as results have been obtained, in the order in which they were begun.

Spraying potatoes with Bordeaux mixture.—A full account of these experiments is given under the section "Plant Pathology," chapter "Potato Spraying B."

Other experimental activity.—An extensive series of co-operative experiments has been planned, and in part begun, to throw light on the question of soil treatment for Club Root of turnips and cabbages (*Plasmodiophora Brassicæ*) on Prince Edward Island. The problem is a difficult one on account of the absence of limestone or other calcareous material, with the exception of a shell deposit known as "mussel mud", and the impracticability of importing lime on account of high freight rates. The absence of drainage, with the consequent production of sour land, is also an aggravating cause which it is hoped the drainage scheme at present being promoted by the Department of Agriculture for the province will, in time, remedy. The experiment is being carried out at five centres on the island and has two questions to answer, namely, "How much lime is needed to control the disease economically?" and, "Will mussel mud take the place of lime?"

More recently, a further series has been planned for the Province of Nova Scotia with the same object in view but using lime and ground limestone instead of mussel mud. It is hoped to be able to give the results in the next annual report.

Several experiments were begun last season on various potato diseases, notably Black Leg (*Bacillus solanisaprus*), to determine the question of possible soil infection and to test the action of various disinfectants on the sets; Powdery Scab, to study the so-called tuber rot and the life-history; and also Leaf Roll, Rhizoctonia, Mosaic, and Curly Dwarf. A study of the length of time the Club Root organism will persist in the soil in the absence of cruciferous plants has been begun also. Of these it is not

necessary to say more at the present than to state that the results will appear in due time.

Scheme for the improvement of the Garnet Chile "seed" potato industry in Nova Scotia.—The author had an opportunity of gaining a preliminary acquaintance with an important potato industry which has been carried on in Nova Scotia for a considerable time when he was instructed to accompany the Director of Agriculture for Bermuda, Mr. E. J. Wortley, through the districts in which Garnet Chile potatoes are grown for the Bermuda trade, in September, 1915. The object of the visit of Mr. Wortley was to carry out the inspection required by the recent order of the Government of Bermuda which requires that no Garnet Chile potatoes be imported into that country unless the crop had been examined during the previous growing season and found satisfactory. A complete tour of all the districts where these potatoes are grown was made and the author visited and inspected almost every individual field. As a result of the examination by the Bermudian authorities, the stock on more than thirty farms was deemed unfit for use as "seed," and leave to import it was refused.

There is no doubt that, from the point of view of the Bermuda planter, the importance of good "seed" is very great. It is a fact of which the writer has since had ocular evidence in the Bermudas that a plant produced from weak "seed" frequently produces tubers, the combined weight of which is less than that of the set from which it sprang. It is also beyond question that good Nova Scotia stock gives a good crop in Bermuda and that fair Nova Scotia stock gives a poor return in the more southern climate. This is the invariable rule. The writer has over and over again traced "seed" from different farms in Canada to various plantations in Bermuda, and has found that if it was a good productive strain here it will give good results in Bermuda, whereas if it were only fair or weak in Canada it will, when planted in Bermuda, give either a very poor crop or else no return whatever. The permanency of the characters of high and low yield are, in this particular case, established beyond question. When one bears this in mind and remembers that every barrel of poor stock imported into the colony entails a loss of from $12 to $24 to the planter who buys it, one is not surprised at the determination of the Government of Bermuda that only the best Canadian "seed" stock be imported and that the poor be rejected.

At this stage the officer in charge of the Field Station for Plant Pathology received instruction from the Dominion Botanist to endeavour to discover the cause of the running-out or degeneracy of the strain, to eliminate the poor stock and grade up the best as much as possible. In the absence of such a course there was serious danger of the trade being lost. When the matter was first brought to the writer's attention, in September, 1915, there was little time available before the close of the season for effecting any improvements. The foliage was dead and the opportunity had therefore passed to rogue the fields and free them from diseased plants. It is possible, however, with a little practice, to pick out the highest-yielding hills from the character of the stalks, it being presumed that by doing so one would get rid of any plants with a tendency towards being run-out and also of all serious hereditary diseases, or at least of such as are carried in the tuber and materially decrease the yield. Three meetings were immediately held which were attended by the principal growers and this course was urged upon them. Two inspectors, one being placed at the writer's disposal by the Department of Agriculture of Nova Scotia, were instructed to direct and help in the selection those farmers who took it up. The movement met with striking success, somewhat more than 60 per cent of the growers in the principal districts going into their fields and hand-selecting a portion of their seed for the following season.

The growers showed such an interest in the movement that a number of "seed potato centres" were organized. The largest, which has headquarters at Clifton, N.S., and which goes by the name of "the Clifton Garnet Chile seed potato centre," has a membership roll of twenty-eight and an estimated output of about 10,000 bushels.

CHARLOTTETOWN.

The president of the centre is Mr. E. A. Logan, and the secretary, Mr. H. H. McNutt, both of Lower Truro, N.S. The second centre, which has for president and secretary, respectively, Mr. David Sutton and Mr. J. T. Healey, was organized at Church Street, N.S., has a membership of eleven and an estimated output of more than 6,000 bushels. It is named the "Cornwallis Garnet Chile seed potato centre". The third, the "Centreville Garnet Chile seed potato centre," has an output of about 2,000 bushels and a membership of seven. The president is Mr. J. A. McDonald and the secretary, Mr. W. P. Wheaton. Sixty-eight per cent of the growers in the areas mentioned have joined a centre, and as they are, for the most part, the largest producers, the percentage of the total output of potatoes which they will raise will be much in excess of that figure.

Little has been said about the scientific aspect of the causes underlying the degeneracy or running-out of our Garnet Chile potatoes when grown in Bermuda, a condition which is also seen to a less extent in Canada. The pressing need of the practical side of the problem for solution has been in part responsible for this. The writer has, however, been paying considerable attention to it since last September and he is carrying out experiments which will, it is hoped, throw some light on the matter. During the visit to Bermuda already referred to, an amount of experience and experimental material was acquired which will prove invaluable. Co-operative experiments with the Director of Agriculture of Bermuda, the Superintendent of the Experimental Stations at Kentville and Charlottetown, and various growers, are planned, the results of which will be reported in due time.

Correspondence and advisory work.—During the course of the year the officer in charge of the Field Station answered a number of requests for information on various plant diseases, and it is pleasing to note that his services are being more and more made use of. A considerable number of farms were visited, some at the request of the owners, and every possible advice and assistance was given. These visits were principally in relation to Club Root of turnips and misses in potatoes, the latter due principally to Black Leg, aggravated by an unusually wet spring and early summer. In such cases it was possible to give information, which, if followed, would largely abate or prevent the recurrence of the evil. The writer, both personally and through inspectors, spent a considerable amount of time visiting farms to advocate the use of Bordeaux mixture on potatoes, spraying not having come into general use yet on Prince Edward Island. During part of the winter months the services of the writer were placed at the disposal of the provincial Department of Agriculture for the purpose of teaching plant pathology at the Short Courses in agriculture, which were held in various parts of the Island. Six courses were attended, namely, at O'Leary, Mount Carmel, Egmont Bay, Murray River, Mount Herbert, and Tracadie. The attendance was remarkably good, amounting in several cases to more than one hundred at each of the thirteen two-hour sessions. From the interest shown in the lectures, which were given on the commonest plant diseases, the author expects good results in the putting into practice of potato spraying, seed treatment for grain and potatoes, precautionary measures for the avoidance of Club Root, and the various other courses advocated. In no other way can one get into close touch with so many farmers and discuss their local problems to better advantage than by the holding of local Short Courses in agriculture.

A commodious Field Station (Plate LXII), in which to carry on the work of the Division, has been erected under the direct supervision of the officer in charge for the province during the past season. It is conveniently situated on the Experimental Station grounds at Charlottetown, and contains a laboratory measuring 17 feet by 15 feet, with three northern lights, an office 13 feet by 9 feet, besides a photographic room, lavatory and hall, and a very large basement for the storage of coal, roots and potatoes. The building is a one-storey bungalow of frame construction and presents a good appearance. It was erected according to the plans and specifications of the officer in charge.

During the course of the building operations, as in many other ways, the writer has had the benefit of the experience of Mr. J. A. Clark, the Superintendent of the Experimental Station at Charlottetown, to whom he wishes to express his indebtedness. The writer is also indebted for cordial co-operation to the inspectors now or formerly under his charge: Mr. Rolf Holmden, now in the 5th Royal Highlanders: Mr. W. O. Johnston, Mr. M. H. Jenkins, and Mr. S. G. Peppin.

VI. REPORT FROM THE FIELD LABORATORY OF PLANT PATHOLOGY, FREDERICTON, N.B.

(G. C. CUNNINGHAM, B.S.A., *Assistant in Charge.*)

The laboratory was established July 1, 1915, for the purpose of conducting the work of the Botanical Division, in the province, in conjunction with the Dominion Experimental Station at Fredericton, N.B. The work to be undertaken naturally falls under two headings, research and educational extension. The officers will spend much of their time assisting the farmers in controlling and eliminating plant diseases, which are seriously injuring their crops. This will be accomplished by conducting illustration experiments and demonstrations in various sections of the province, and by giving addresses on plant diseases before the various agricultural conventions and conferences, which are frequently held. The main object of the laboratory will be to conduct research on diseases of agricultural crops and other botanical problems pertinent to the advancement of agricultural science in the province of New Brunswick.

The need for this laboratory is apparent when we consider the great losses which are caused annually by plant diseases. Approximately 50 per cent of the possible potato crop was destroyed by disease during the past season. A field survey conducted last summer on 100 farms in the larger potato-growing areas showed that the average loss caused by four common diseases amounted to 47 per cent of the total possible crop, or about 5,640,000 bushels. These diseases and the ensuing losses were: Blackleg, 7 per cent (840,000 bushels); Rhizoctonia (Little Potato Disease), 5 per cent (600,000 bushels); Mosaic, 10 per cent (1,200,000 bushels), and Late Blight (Rust), 25 per cent (3,000,000 bushels).

Some other diseases are equally injurious. Club-root of turnips and cabbage has become so serious in the Maritime Provinces that many farmers have abandoned turnip growing, because of its ravages. The apple scab and other diseases of fruit trees cause considerable damage and are in urgent need of investigation. These and many other problems will be studied as opportunity presents itself.

The department was especially fortunate in securing the second floor of the old post office, lately occupied by the Customs and Immigration officers, on the corner of Queen and Carleton streets, for this laboratory. The work of fitting up these rooms is now under way, but has been delayed somewhat until the previous occupants could have their new quarters equipped.. The space thus supplied will prove ample and in every way suitable for the work, as well as being convenient for the general public. It is proposed to leave the description of this laboratory for a future report, and until the building is properly fitted up.

In spite of the fact that the laboratory was not established until late in the season, considerable preliminary work has been accomplished which will serve as a basis for future investigations. During the summer material and information was collected for work on the Mosaic and Rhizoctonia diseases of the potato and on Club-root of turnips. A few results obtained on potato spraying have been reported in another section. Observations on the resistance of plants to disease are interesting and will be recorded here. Experiments were conducted to determine the influence of different fertilizers on the following potato diseases: Common Scab, Rhizoctonia, Late Blight Rot and Silver Scurf. Another series of studies was conducted on the resistance of different varieties of potatoes to disease; these results will be withheld

until further information has been obtained. The following report partially covers the work of the past year:—

Acknowledgments.—I desire to acknowledge the valuable assistance of the Dominion plant disease inspectors who have been connected with this laboratory, particularly Mr. George Partridge and Mr. J. R. Brownlee, who conducted the spraying on the experimental plots. I am indebted to the Provincial Department of Agriculture for having provided temporary quarters for myself and assistants during the past season and for encouragement and aid in numerous other ways. I further wish to acknowledge the co-operation, advice and assistance of Mr. W. W. Hubbard, Superintendent of the Dominion Experimental Station. He has encouraged the work by supplying land, seed and labour for the experiments and by permitting me to use his experimental plots for plant disease studies.

Correspondence.—During the first five months after the laboratory was established, the correspondence was small, but during the last four months it has been rapidly increasing. In all, 818 official letters and 456 circular letters, in addition to 2,450 posters and programmes, advertising the New Brunswick Potato Growers' Association, have been sent out. The rapid increase in our correspondence is an indication of the interest taken in our work by the general public. This end of the work will undoubtedly continue to increase as the farmers become more acquainted with our work, and as we accumulate information which will be of service to them.

Meetings attended.—Considerable time was devoted to attending and addressing agricultural conferences and conventions. During the winter months the writer delivered twenty-two addresses at various meetings on the following subjects: (1) "Types of Plant Diseases," (2) "Potato Diseases," (3) "Potato Improvement and Seed Selection," (4) "Preparation and Application of Sprays and Disinfectants," (5) "Club-root of Turnips and Allied Plants, and its Control," (6) "Bacteria in Relation to Dairying." The following are among the more important meetings attended and addressed: (1) Farmers' Short Course, at Bathurst, N.B., (2) School Teachers' Course in Agriculture, at Sussex, N.B., (3) Farmers' Short Course, at Truro, N.S., (4) Farmers' Short Course, at Sussex, N.B., (5) Annual Convention of the Nova Scotia Farmers' Association, at Windsor, N.S., (6) Farmers' Short Course, at Yarmouth, N.S., (7) Farmers' Short Course, at Lawrencetown, N.S., (8) Annual Convention of the New Brunswick Farmers' and Dairymen's Association, at Fredericton, N.B., (9) Annual Seed Fairs, at Sussex and Chatham, N.B., (10) The New Brunswick Potato Growers' Convention, at Woodstock, N.B.

New Brunswick Potato Growers' Convention.—Potato growing, which is possibly the greatest agricultural industry in New Brunswick, required considerable attention. As there was no body of interested growers which could be used as a medium for spreading information, or as an organization to work in behalf of potato improvement, steps were taken to form such an association. At a convention of potato growers held at Woodstock on March 22 and 23, this question was brought forward and the convention developed into the permanent organization of the New Brunswick Potato Growers' Association.

The association has been organized to promote the interests of the potato industry in the province of New Brunswick, by disseminating information on methods of cultivation, suitable varieties, seed improvement, grading, standardizing, marketing, and eradicating and controlling fungus and insect diseases, and allied subjects. It has adopted a wide and efficient policy for carrying into effect the work on potato improvement and it already promises to be an important factor in the development of the industry.

During the coming season, special attention will be given to the improvement of potatoes for seed and table purposes, through seed selection and the control of potato

diseases. The association hopes to accomplish this task by having its members conduct co-operative experiments along several lines. These will be planned and supervised by the staff of this laboratory and the results recorded in our annual report. Such experiments, if properly conducted, will be productive of valuable information to us and will also serve as much-needed illustrations of what can be accomplished on the ordinary farm.

Variety Resistance of Potatoes to Disease.—Eighty-one different varieties of potatoes were studied during the season to determine their comparative resistance to some of the more common diseases. During the growing season the tops were examined twice and the occurrence of the following diseases noted: Late Blight, Early Blight, Tip Burn, Mosaic, and Rhizoctonia. Owing to the voluminous nature of these records, and also because the seed stock was not necessarily free from disease, which is a very important requirement in such studies, it does not seem advisable to report on them in detail until more information has been obtained. However, it seems well to call attention to the fact that the results obtained this year are sufficiently promising to warrant the work being continued more extensively next season. This was particularly noticeable in connection with Late Blight and Mosaic resistance. The following varieties showed considerable resistance to Late Blight: Brydon's Beauty, Brydon, Fannie Dean, Monarch, New Chieftain, New Scotch Rose, Pierremont Seedling, Provost, Superlative, Scottish Triumph, Table Talk, Up-to-Date, Vicks' Extra Early, and White City. The following varieties appear to be among the most susceptible: Acquisition, Burbanks' Seedling, Carman No. 3, Clyde, Dreers' Standard, Early Nebraska, Early Ohio, Early May, Early Six Weeks, Early Triumph, Everett, Queen of the Hebron, Rawlings' Kidney, and Wee McGregor. There was also considerable variation in respect to the Mosaic disease; some varieties were completely free, while others were badly infected.

During the winter months, one bushel of tubers of each variety was carefully examined for the occurrence of Common Scab, Rhizoctonia, Silver Scurf, and Late Blight Rot. This work was not so promising, but will also be continued during the coming season.

VII. GENERAL.

Changes in Staff.—New Field Laboratories.—Two new field laboratories of plant pathology were established during the year. One was erected in form of a small suitable building in the grounds of the Experimental Station at Charlottetown, and covers for the present time the requirements of the provinces, Prince Edward Island and Nova Scotia. The Hon. Martin Burrell, Minister of Agriculture, authorized the appointment, as officer in charge, of Mr. Paul A. Murphy, B.A., A.R.C.Sc. I.

Mr. Murphy has had an exceptionally useful training in botany and plant pathology. He received his preliminary education at the Royal College of Science, Dublin, and later held a position as assistant under the Irish Department of Agriculture. He was then fortunate in receiving a travelling scholarship, and spent one year at the most important plant pathological centre of Germany. One year of study was spent at the Imperial College of Science, Kensington, England, and one year at the department of Plant Pathology of Cornell University. The experiences of an officer of Mr. Murphy's training will be most valuable to the Canadian farmer.

The field laboratory at Fredericton, which occupies very satisfactory quarters in the old post office building, is in charge of Mr. G. C. Cunningham, B.S.A. Mr. Cunningham graduated from the Agricultural College at Guelph. He then occupied several positions in the United States and finally was appointed Associate Plant Pathologist of the Experiment Station, Burlington, Vermont. He was offered a position under this Government some few years ago, but the station authorities induced him to remain

there. The work which Mr. Cunningham has done, especially in connection with the study and control of Club Root and Potato Scab, has shown him to possess valuable gifts of observation and powers of research which are most acceptable.

Both officers commenced their work in July, 1915.

Mr. F. Lisle Drayton, B.S.A., Assistant Plant Pathologist, was granted leave of absence from September to join the military forces. Miss Faith Fyles, B.A., Assistant Botanist, was absent on sick leave from December to the end of the fiscal year.

Although the absence of these two officers was considerably felt, every effort was made by the remaining staff to take charge of the work that otherwise fell to their absent colleagues.

Library, Records and Scientific Collections.—Apart from the routine clerical work and special experimental and investigation work, there have been in the past and are now accumulating various details involving often a technical knowledge of wide scope. Among such work were the arranging, numbering and indexing of the Divisional library, with the almost daily recording of numerous pamphlets and periodicals received. The desire is to obtain a comprehensive and well-arranged technical library so that the same may be available to every consultant.

Some 268 specimens of local flora have been added to the herbarium. The mycological collections have also been arranged for consultation, similarly to the flowering plants herbarium. The keeping of records of the work done by the Division is also occupying considerable time; this includes the keeping of photographic records of individual diseases, or experimental observations.

Nitro-Culture Work.—(Plate LXIII).—Last year a start was made by supplying the various Experimental Farms with cultures, prepared in the Ottawa Laboratory, of leguminous root-nodule bacteria. Some seventy-five cultures were sent out last year. When we state that the increase to date has been over ten-fold and the work is still only in its first stages, it will be easily understood that, with the reduced staff, the energy of those remaining was very highly taxed. Acknowledgements in attending to this work are due to Mr. P. R. Cowan, B.S.A., who, in his spare moments, when not attending to his duties as plant disease inspector, brought much interest and appreciative skill to bear.

In view of the fact that it has been established that plant diseases such as Club Root, Potato Rosette and Powdery Scab and others may be conveyed by the use of infected soil, it is considered advisable to replace inoculation with soil, as much as possible, by seed inoculation with pure culture when there exists no such danger, and when, no doubt, considerably more active bacteria are introduced.

Experience would also indicate that use of cultures should preferably be restricted to alfalfa. For many years before one ever thought of bacteria in relation to the growth of legumes, red clover, white clover, and alsike have been grown in Canada and without cultures became excellently established. The same applies in a large measure to ordinary beans and peas. Alfalfa, no doubt, is benefited by inoculating organisms, and cultures will be at the disposal of any farmer free of charge.

Publications.—In conclusion, the following list of publications may be mentioned:—

John Adams, M.A., Bulletin Second Series No. 28, "The Cultivation and Handling of Flax for Fibre." Also Exhibition Circular No. 77, "The Cultivation of Flax for Fibre."

P. A. Murphy, B.A., A.R.C.Sc.I., Circulars No. 10, "Late Blight and Rot of Potatoes;" No. 11, "The Black Leg Disease of Potatoes." Exhibition Circulars No. 81, "Potato Spraying for Late Blight and Rot;" No. 82, "Black Leg Disease of Potatoes."

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PLATE LXI.



Germination of Wild Rice. — Seed of wild rice collected in fall should be buried in soil over winter and when tested in spring it will germinate as shown above.



The Dominion Field Laboratory of Plant Pathology of the Division of Botany, at Charlottetown, P. E. I.



Root Nodules of Clover. — This clover shows numerous root nodules produced by the nitrogen fixing bacteria supplied in the so-called "nitro culture" supplied by this Division.

DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE
DOMINION EXPERIMENTAL FARMS

REPORT

FROM THE

DIVISION OF BEES

FOR THE

Fiscal Year Ending March 31, 1916

PREPARED BY

The Apiarist, Dominion Experimental Farms. - - - - - F. W. L. Sladen.
Superintendent:—
Experimental Station, Charlottetown, P.E.I. - - - - - J. A. Clark, B.S.A.
Experimental Farm, Nappan, N.S. - - - - - - - - - W. W. Baird, B.S.A.
Experimental Station, Kentville, N.S. - - - - - - - W. S. Blair.
Experimental Station, Fredericton, N.B. - - - - - - W. W. Hubbard.
Experimental Station, Ste. Anne de la Pocatière, Que. - Jos. Bégin.
Experimental Station, Cap Rouge, Que. - - - - - - - Gus. Langelier.
Experimental Farm, Brandon, Man. - - - - - - - - - W. C. McKillican, B.S.A.
Experimental Farm, Indian Head, Sask. - - - - - - - W. H. Gibson, B.S.A.
Experimental Station, Lethbridge, Alta. - - - - - - W. H. Fairfield, M.S.
Experimental Station, Lacombe, Alta. - - - - - - - G. H. Hutton, B.S.A.
Experimental Station, Invermere, B.C. - - - - - - - G. E. Parham.
Experimental Farm, Agassiz, B.C. - - - - - - - - - P. H. Moore, B.S.A.
Experimental Station, Sidney, B.C. - - - - - - - - L. Stevenson, B.S.A., M.S.

REPORT FROM THE BEE DIVISION.

OTTAWA, Ont., March 31, 1916.

J. H. GRISDALE, Esq., B. Ag.
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith the second annual report of the Bee Division.

The work of the Division has continued to develop rapidly during the past year. A much-needed apicultural building, measuring 27 feet 6 inches by 32 feet, with three stories, providing 2,100 square feet of floor space, finished in red brick, has been erected in the northwest corner of the orchard at the Central Experimental Farm. The building contains, on the ground floor, a large laboratory, two offices and a dark room; on the upper floor two rooms, and in the basement, besides the accommodation for the furnace, three bee cellars, which are wholly underground, and, therefore, well insulated from changes in the outside temperature. Fresh air is brought into the cellars by earthenware pipes passing under the ground. There is a chimney from each cellar passing through the building to carry away the waste air. The building was occupied on February 11, 1916. The gathering of the apicultural work into one building, with the apiary close at hand, will greatly facilitate the experiments that are being conducted with bees.

Thirteen of the Branch Farms and Stations now keep bees, namely: Kentville, N.S.; Charlottetown, P.E.I.; Nappan, N.S.; Fredericton, N.B.; St. Anne de la Pocatière, Que.; Cap Rouge, Que.; Brandon, Man.; Indian Head, Sask.; Lethbridge, Alta.; Lacombe, Alta.; Invermere, B.C.; Agassiz, B.C., and Sidney, B.C. The work at these Farms and Stations has been further organized during the year. I inspected each apiary during warm weather in 1915, and gave advice to the Superintendents and to the men in charge of the bees. The western Farms and Stations were visited in the spring; the eastern Farms and Stations were visited in July.

At Indian Head, visited on May 5, it was noticed that the stores in the hives consited largely of old honey which indicated that the Manitoba maple (*Acer negundo*), which is abundant at this Farm and was in bloom during the preceding period of warm weather, is probably an unimportant source of nectar. The two colonies of bees here were building up well. This farm was visited again on May 31, when each colony was found to be fast filling a super of shallow extracting combs with a light coloured honey which was pleasantly sweet with a slight flavour of prunes. Evidently this honey was gathered almost entirely from the Siberian pea tree (*Caragana arborescens*), there being about 2,500 feet run of hedges of this shrub, from 16 feet to 20 feet high, at the Farm. No other source of honey could be found at this time, except dandelions, which were nearly over, and the silverberry (*Elæagnus argentea*), the flowers of which were small and secreting nectar scantily owing to the prevailing drought, with a little milk vetch and a few ornamental *Loniceras* on the lawn.

The Station at Sidney with eleven colonies was visited on May 8. All except two colonies were rather weak and backward. The bees had evidently suffered from the exposed situation of the apiary, which is to be moved to a better site, and some of the

queens were unprolific. However the colonies were gaining in weight a few ounces per day from such sources as blackberry, raspberry and wild pea.

At Agassiz, visited on May 11, eleven colonies had gathered a remarkably large surplus of honey from the Coast maples, and 200 pounds had been removed three days previously. Unfortunately, the colonies had swarmed badly, and the brood combs were clogged with pollen and honey, and contained very little brood, so essential at this time for the production of bees to gather honey from the main honey-flow which comes from clover in July. Special precautions are evidently needed to prevent these troubles when, as in the present year, the conditions are favourable for a good flow from the maples.

After making an inspection of conditions in the Okanagan Valley and visits to local apiaries, I reached Invermere on May 17. Here, though the weather was cloudy and cool, the bees were raising much brood upon nectar gathered from the bearberry (*Arctostaphylos uva-ursi*) which is abundant in this locality. The flowers of this plant each contained a drop of nectar as large as a pin's head, and apparently the only reason why the bees did not store it in large quantities was that the narrow opening of the flower held it out of their reach.

At Lethbridge, the next Station visited, the bees—two colonies— were getting barely sufficient nectar from mixed sources, mostly ornamental shrubs that had been planted at the Station, to maintain satisfactory breeding. At an apiary located three miles from the Station, that was visited at this time, breeding was being seriously curtailed by a shortage of food, and I advised stimulative feeding. The conditions here —warm sunny weather with practically no forage, no other apiaries near and a prospect of a long and abundant yield from alfalfa starting in about six weeks—were favourable for outdoor feeding, and I suggested a trial be made of this, mixing sugar and water in the proportion of about 1 to 9 and placing the syrup in a tub in a place sheltered from wind about one hundred yards from the apiary with cork chips floating on the surface to prevent the bees from drowning. It may be remarked here that long experience has shown that feeding during a period of cold, unfavourable weather in spring is largely ineffectual for stimulating brood rearing, but it may be necessary to avert starvation. From the fact that at our apiary at Lethbridge 175 pounds of honey per colony, spring count, were obtained in 1915, and 100 pounds from the only strong colony in 1914, all this principally from alfalfa, it is evident that Southern Alberta is within the zone, extending from Mexico to Canada in the irrigated region of the western prairie, in which good crops of honey may be obtained from alfalfa.

At Lacombe, visited on May 26, the two colonies of bees were in a very strong and forward condition with much brood and honey, a good deal of which was coming from dandelion. They were ready to be supered.

On the 23rd of May a few hours were spent at Calgary, where the vacant lots were yellow with dandelion bloom, the result of the recent rains, but no bees were seen working on it, although the tubes were so full of nectar that it could be seen glistening in them. Evidently few or no bees are kept in this city.

At Brandon, visited on June 1, the bees were strong and ready to be supered, but the loss of our experienced apiarist, Mr. Mynott, by enlistment, with a shortage in the supply of frames and foundation, made the swarming problem look threatening.

During the western trip, prominent bee-keepers at North Vancouver, Edmonton and at Slate River, Ont., were called upon.

The Station at Cap Rouge was visited on July 5. The honey flow from alsike and white clover was commencing, but the apiary of twenty colonies had become disorganized with swarming, about one-half the number of colonies being not strong enough to work in supers.

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Ste. Anne de la Pocatière was visited on July 7. At this date the apiary consisted of thirty-five colonies, to which number it had been reduced from forty-five by uniting in May. About 200 pounds of early honey had been extracted on June 29. This honey was of a bright amber colour and had a pleasant flavour in which dandelion could be detected. The bees were working busily on alsike and the supers were filling rapidly.

Fredericton was visited on July 8 and 9 in weather too wet and cold for opening the hives. Here there were ten colonies including four swarms. This is a good district for honey production.

At Nappan, visited on July 12, fourteen colonies were found, six of these being swarms. Eight colonies were working in supers. Here again, swarming was checking the filling of the supers. The prospects for a large crop of honey, however, were excellent, alsike being abundant, especially in the marshes.

At Kentville, visited July 13 to 15, I found seventeen colonies, but only ten of these working in supers, due again to swarming having run riot. A prime swarm that had been produced by a prime swarm was preparing to swarm again, having eggs in queen cells, although no young workers had yet emerged and the old bees were dying off fast; the few bees remaining, being busy in the fields, had neglected to feed the brood sufficiently, some of which was dying, a condition that might easily be mistaken by an inexperienced bee-keeper for European foul brood. Honey was being gathered in abundance from alsike, white clover and wild radish.

The bees at Charlottetown, visited July 20 and 21, were in a backward condition, due partly to winter loss from granulated honey and partly to the long, cold spring. All the colonies are breeding well, none had yet swarmed, and only two were beginning to work in supers.

While in Nova Scotia I visited, at the request of the Provincial Department of Agriculture, a number of bee-keepers in the Annapolis valley in company with the Provincial Entomologist and his assistants, with the objects of ascertaining the extent of the outbreak of American foul brood that had been discovered on my visit the previous year, of considering in what manner it should be dealt with and also of demonstrating how the disease should be treated. The disease was not found outside the vicinity of Wolfville and Kentville. Both in the Annapolis valley and at Amherst, N.S., where apiaries were visited, heavy yields of the finest honey were being got from alsike and white clover, and these, in many instances, could have been more than doubled had swarming been kept under control.

When in Prince Edward Island, I, at the request of Mr. Theodore Ross, Secretary for Agriculture, spent three days, in company with the Superintendent of our Station at Charlottetown, visiting apiaries in the Charlottetown, Kensington and Granville districts. Foul brood was found around Charlottetown. There is no doubt that bee-keeping conducted on modern lines would pay well in the Island on account of the abundance of white and alsike clover with sufficient moisture and heat for honey production from these, but, as yet, the industry is in its infancy, and education along the lines of better and more systematic methods of bee management is much needed. This remark is true of the whole of the Maritime Provinces, in many parts of which bee-keeping ought to be most profitable, and we have an important work to do in discovering and demonstrating how modern methods of apiculture can be adapted to suit the special conditions found in this part of Canada.

It is evident that throughout Canada swarming is one of the chief obstacles in the way of greater production in the apiary. At the present time the most successful methods of swarm prevention are by manipulation. The most effective manipulations are those in which the brood nest is enlarged so that it will become less crowded with young bees and the queen will have more room to lay. Hives of not less than 10-frame capacity should be used by preference. The brood nest may be allowed to expand by omitting to place the queen excluder between the brood chamber and the first super of

empty extracting combs that is given when the brood chamber is nearly full of bees. When the honey-flow has well started the queen should be again confined to the brood chamber by inserting the queen excluder. Seven or eight days later any queen cells that may have been built in the super should be cut out.

Another method of expanding the brood nest for the prevention of swarming is to do it periodically on a certain day every week during the swarming season, taking out of the brood chamber and placing in the super, above the queen excluder, one or two combs containing honey, or capped brood, and filling their place with empty combs, or, if these are unobtainable, frames fitted with full sheets of foundation. At the same time a search should be made for queen-cells containing eggs and larvæ, the presence of which indicates that the bees are preparing to swarm. By destroying all of these, swarming can almost always be put off for eight or nine days, but the bees will often loaf more or less when they are thus preparing to swarm.

The weekly examination helps to systematize apiary work and makes for the efficient management of the apiary and the prompt supply of the bees' requirements, and it has been decided to adopt it, especially with the view of controlling swarming, in the apiaries of the Dominion Experimental Farms. It was initiated too late in the season of 1915 for reporting definite results.

As bees will produce about two pounds of extracted honey to one section of comb honey, and since on this basis an adequate price for comb honey is seldom obtained, the greatest part of the honey produced at the Experimental Farms is extracted honey.

The accompanying table summarizes the results obtained from the bees at the Dominion Experimental Farms during the year 1915. Lethbridge produced the highest value per colony, spring count, namely, $31.59 for 175·5 pounds of honey, mainly from alfalfa, and $7.70 for increase, total $39.09. Nappan showed the highest yield of honey per colony, namely, 178·6 pounds, mainly from white and alsike clover, which sold for $21.43. The quality of the honey varied from good to excellent, with the exception of a small quantity of dark, unpalatable honey gathered in the spring at Ottawa. The somewhat low yields from Charlottetown, Brandon, Agassiz and Sidney are to be attributed to the poor season and other temporary causes, the yields at these Farms in an average season being considerably higher. For all the Farms, the value of the average amount of honey produced per colony, spring count, was 64·4 pounds, and it sold for $9.96. Including the value of the increase in bees, the total production per colony was $11.21. These figures are satisfactory and show that bee-keeping in Canada is very profitable They would doubtless have been higher had not one or two colonies been used for exhibition purposes at most of the Farms. A still better showing may be expected when the men in charge of the bees, most of whom are only learning apiculture and spend most of their time at other work, have acquired more experience. The cost of a hive of bees averages about $10 and the cost of maintenance other than labour, consisting chiefly of the cost of comb foundation and sugar for autumn feeding, may be put at $1 per colony a year. Allowing another $1 for honey containers and incidental expenses, a profit in honey production of $7.96, or in honey and bees of $9.21, per colony, that is to say, 79·6 per cent and 92·1 per cent respectively on the capital outlay,[1] not allowing for labour, is shown. That bee-keeping is well worth the labour expended is shown by the fact that an experienced and active bee-keeper can easily attended to two hundred colonies without hired help. Such a large number should usually be kept in two or three yards. This calculation is made to show that efficient management of the apiary is well repaid, and not with the object of showing that a man should decide to make bee-keeping his prin-

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1 For producing extracted honey an additional outlay of from $10 to $20 or more is needed for a honey extractor and other appliances, and in a moderate or large-sized apiary a wooden house in which to extract the honey and keep supplies, costing to build in materials and labour about $100 or more, is practically a necessity. Of course, an existing out-building may often be adapted to this purpose.

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cipal business except in very favourable localities and when the requisite knowledge and experience have been acquired. Few crops are so dependent upon favourable weather as the honey crop, and in the best of localities the yield may be light some years. Nevertheless, where success has been attained on a small scale it will pay to keep fifty to one hundred colonies, making bees the source of a large part of the income, especially in the case of those who are engaged in such callings as school teaching, store-keeping and clerking work, who often have time to spare in the summer. Bee-keeping is worthy of the attention of disabled soldiers because it is a health-giving occupation requiring but little capital. Experience seems to show that it takes a man at least two years to learn to manage bees sufficiently well to keep a large apiary.

OTTAWA.

SUMMARY OF PRODUCTION OF BEES

Name of Farm.	Number of Colonies, Spring count.	Number lost during Winter.	Number of Combs covered by Bees at first examination in Spring, average per Colony.	Total Honey Crop: one finished section is equivalent to one-and-a-half pounds.	Weight of Extracted Honey or equivalent of Comb Honey produced per Colony, Spring count.	Selling Price of Extracted Honey per pound.	Value of Honey produced per Colony, Spring count.
				Lbs.	Lbs.	cts.	cts.
Charlottetown	5	4	2·20	55	11·0	20	2.20
Nappan	8	0	4·81	1,429	178·6	12W	21.43
Kentville	6	0	5·29	559	93·2	12	11.18
Fredericton	6	1	3·70	369	61·5	18	11.07
St. Anne de la Pocatière	44	0	3·57	2,686	61·0	15 & 20 R. 12 W. Av. 13¾	8.39
Cap Rouge	12	2	4·45	595	49·6	15	7 44
Ottawa	58	[illegible]	2·70	4,154 A	72·2	15 & 12R. Av. 13½	9.82B
Brandon	28 C	2	4·46	305	14·5	16	2.19D
Indian Head	2	0	5·50	103E	51·5	22	11.22
Lethbridge	2	0	6·50	351	175·5	18	31.59
Lacombe	2	1	6·00	105 F	52·5	16½	8.66
Invermere	11	0	5·50	332	30·2	20	6.04
Agassiz	7	0	Unknown	278	39·7	15	5.95
Sidney	12	0	3·83	148	12·3	20	2.46
Average	14	1	4·59	819	64·4	16½	9.96

A. Not including 95 pounds of unsaleable dark honey gathered in the spring.
B. 72 sections sold at 20 cents each.
C. Seven of these colonies sold.
D. 70 sections sold at 20 cents each.

AT DOMINION EXPERIMENTAL FARMS, 1915.

Greatest Yield from one Colony.	Percentage of Colonies, Spring count, that swarmed or were divided.	Number of Colonies in good condition for Winter.	Total value of Increase. Each additional Colony is valued at $5.	Value of Increase per Colony, Spring count.	Value of Loss of Bees per Colony, Spring count.	Value of Total Production (honey and increase) per Colony, Spring count.		Notes.
Lbs.			$	$	$		$	
Unknown.	20%	4	0.00	0.00	5.00	Loss	2.80	Colonies wintered badly.
231·0	85%	13	25.00	3.12	.....	Gain	24.55	Alsike and white clover abundant this year; yield reduced by excessive swarming.
80,2	100%	14	40.00	6.66	.....	"	17.84	
102·5	100%	10	3.00	0.43	.....	"	11.50	Yield reduced by cold, late spring and excessive swarming.
116·0	22%	34	0·00	0·00	1.31	"	7.26	Yield of short duration as usual.
92·0	58%	16	10.00	0.83	.....	"	8.27	Yield reduced by swarming.
173·5	36%	49	0.00	0.00	1.30	"	8.52	Yield reduced by winter losses and by breeding and swarming experiments.
Unknown.	Unknown.	26	15.00	0.53	.....	"	2.72	Poor yield attributed to difficulty of controlling swarming in 8-frame hives.
48·0	75%	6	12.50	6.25	.....	"	17.47	Considerable honey from *Caragana*.
85·7	100%	5	15.00	7.50	.....	"	39.09	Honey principally from alfalfa.
63·7	50%	4	5.00	2.50	.....	"	11.16	Bees wintered very well.
80·0	0%	11	0.00	0.00	2.50	"	3.54	Nine colonies acquired in spring.
79·0	66%	7	0.00	0.00	.....	"	5.95	Clover crop a failure because of unfavourable summer.
41·5	16%	11	0.00	0.00	0.41	"	2.05	Colonies built up too slowly in spring.
99·4	59	14	.....	Increase	1.25	Gain	11.21	

E. Not including production of two colonies acquired in June.
F. Not including production of one colony acquired in June.
R. Retail.
W. Wholesale.

I have felt that in our young country, with its boundless resources, of equal importance to ascertaining and showing how bees can be managed so as to get a maximum of profit from each hive, is the work of discovering the quantity and quality of surplus honey that a well-managed colony may be expected to produce in an average year in different locations. To make these estimates involves a study of the principal honey producing plants of Canada, of the conditions of climate and soil affecting their abundance and development, the abundance of their yield and also of the duration of the yield. During the year under review progress has been made in this work. Some of the work has been done in temporary out-apiaries in the open country, where the particular honey plants it has been found desirable to study are abundant. These temporary apiaries have been established in connection with the Central Farm and two of the Branch Farms, namely, Cap Rouge, Que., and Invermere, B.C. It is expected that the information obtained will prove of considerable value to bee-keepers, showing them where bees may be kept with greater profit.

The formation of collections of specimens of the honey plants of Canada and of samples of the honeys produced by them has been commenced.

Experiments in the breeding of bees have been continued at the Central Farm, and useful data have been secured.

The subject of humidity in the bee cellar during winter has been investigated in detail at the Central Farm, where a considerable mortality of bees was discovered to be due to unwholesome and granulated stores with insufficient moisture. Experiments have been made to ascertain how the deficiency in moisture may best be prevented or remedied.

Since some of the conditions for important features of bee investigation work are not met with in our own apiaries, co-operative experiments have been started with several enlightened bee-keepers in different places.

Progress has been made in the cataloguing of the species of the wild bees of Canada. Special attention has been paid to the important genera, *Andrena* and *Megachile*. Several of the species of the former genus are of value in pollinating fruit bloom. and species of *Megachile* have been observed to aid in the pollination of alfalfa. One of the commonest species of *Megachile* on the prairie is *M. melanophœa* Sm., variety *calogaster,* Ckll. Tables are being prepared showing the characters by which the species may be distinguished from one another, and giving their distribution, food plants and other notes.

I have prepared a bulletin entitled "Bees, and How to Keep Them," and this is now in the press. It will replace Bulletin No. 69, which is now out of print, and will give in concise form general information upon the subject of bee-keeping. The demand for a publication of this nature is steadily increasing.

During the year I gave addresses at several bee-keepers' meetings. The first one was an address and demonstration with bees at a well-attended gathering of bee-keepers held at the Experimental Farm at Kentville, N. S., on July 13. I delivered an illustrated address on "Honey production from golden-rods and asters," at the Annual Convention of the Ontario Bee-Keepers' Association at Toronto, November 23. Five lectures were given at the Apicultural Short Course at Guelph, Ont., January 17 to 20, 1916, an evening lecture to the students' Apicultural Club, Guelph, on February 21, and an address was given at the Annual Convention of the New Brunswick Bee-keepers' Association at Fredericton on March 2.

Mr. E. W. M. Atkins, a third-year student at the Ontario Agricultural College, Guelph, was appointed to act as my temporary assistant during the summer, and he, and also my stenographer, Miss M. J. Donald, and my laboratory assistant, Mr. P. Caron, rendered valuable service.

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Between April 1, 1915, and March 31, 1916, 1,065 letters were received in this Division and 1,357 letters were dispatched. These figures do not include the French correspondence, which it is estimated amounted to ten per cent of the correspondence in English.

I have the honour to be, sir.
Your obedient servant,

F. W. L. SLADEN,
Apiarist.

OTTAWA.

CENTRAL EXPERIMENTAL FARM, OTTAWA, ONT.

REPORT OF THE APIARIST, F. W. L. SLADEN.

The period of summer-like weather during the last half of April with a little nectar coming in from willows, maples and other flowering trees, caused rapid breeding, and, although the chilly weather in May was somewhat trying and dandelion was unproductive of surplus, the colonies built up well, so that by June 1 the majority were ready for supering. On June 1 to 7 it was noticed that a dark and unpleasant smelling honey was being stored in the supers. To prevent the crop of white honey getting debased with this inferior product, as soon as it was seen (June 12) that the bees had begun to store white honey in its place, all the honey in the supers, amounting to 290 pounds, was extracted and the supers were given back to the bees. The dark honey had a strong and what would be considered by most people a very disagreeable flavour, but so great was the demand for new honey that 195 pounds of it were sold at the regular price of dark honey, namely 12 cents per pound, before the white honey was ready. The source of the disagreeable element in this honey could not be definitely ascertained. At the time it was being collected the bees were seen to be busily working on the hound's tongue (*Cynoglossum officinale*) but the nectar in the honey-stomach of bees working on this plant was clear and without strong flavour.

White and alsike clover were in full bloom on June 14, but, although good rains had fallen and the weather was warm on several days, the colonies on scales did not begin to gain in weight appreciably until June 25. Rapid gains averaging 7½ pounds per day took place between July 9 and August 3, the highest gains being 11 pounds on July 20 and 11 pounds on July 23.

The honey crop consisted of 290 pounds of dark spring honey of which 195 pounds were sold at 12 cents per pound; 2,321 pounds of light honey gathered during June and July, sold at 15 cents per pound, 1,530 pounds of dark amber honey gathered in August and September sold at 12 cents per pound, and 72 sections of comb honey sold at 20 cents each. The flavour of clover honey in the light honey was overpowered by that of basswood, which yielded a considerable amount of honey in this district for the first time in several years. The flavour of buckwheat honey could scarcely be detected in the August honey, although buckwheat was grown in the neighbourhood.

On August 25 two colonies of bees were brought to the spot that had been used in former years as a bee-mating station on the sandy plain at Kazabazua, Que., in the Gatineau valley, about forty miles north of Ottawa, in order to investigate the yield of honey from two late-flowering species of golden-rod, *Solidago puberula* and *S. squarrosa,* that grow in abundance there, the first-named species having become particularly abundant a section of the plain since it was burnt over in 1913. The colonies were in 8-frame hives, the bees covering only about seven combs. Each colony was given two supers of empty combs in shallow frames. The bees were brought back to Ottawa on September 22. About 80 pounds of honey were extracted from the supers, giving a yield of about 40 pounds per colony. It is estimated that at least three parts of the honey came from *S. puberula* and almost all of the remainder from *S. squarrosa.* The honey was of a light colour and the flavour and aroma were pleasant and distinctly suggestive of golden rod. The honey was somewhat thin owing to the lack of heat to evaporate out the excessive water, but it granulated coarsely and is keeping in good condition at the time of writing, April, 1916. All this honey was gathered after a frost on August 27 had killed potatoes, buckwheat, corn and bracken. The golden-rods

were uninjured by the frost. The browning of the tops of some of the plants, which a casual observer might have ascribed to frost, was due to the fact that in a flower-head of golden-rod the first flowers to open and wither are those at the top or tip of the stem. It is to be noted that these plants gave their crop after the regular honey harvest had ceased, and any bee-keeper having bees in the vicinity of an area in which either of them grows thickly under the conditions found at Kazabazua could get an additional crop by moving them to it.

These two species of golden-rod are not found in the vicinity of the Experimental Farm, Ottawa, but other species are abundant; fully 75 per cent of them belonging to the *canadensis* group. Individually, the members of this group produce comparatively little nectar, but their great abundance makes them of some value collectively if the weather is favourable. The species of the *canadensis* group have a spreading, fern-like inflorescence and have three conspicuous veins, or ribs, on the undersides of the leaves, but in *S. puberula* and *S. squarrosa* the inflorescence is compact and occupies a considerable length of the upper part of the erect stem.

Twelve out of the fourteen Italian queens of non-swarming parentage that were mated in October, 1914, at Kazabazua, Que., with drones of the same parentage survived the winter and were tested for swarming propensity in 1915. The test consisted in seeing whether or not the colonies headed by these queens would build queen cells in preparation for swarming when moderately crowded. Nine colonies built queen cells, but a large proportion of the queens proved unprolific, and it was evident that in at least four colonies the queen cells were built as the result of the supersedure impulse rather than of the swarming impulse. The conclusion was reached that the queens had become impaired by being reared and mated so late in the season and that queens reared in this way are not suitable for a breeding test of this kind.

Uniting and feeding for winter was completed about October 10. Twelve colonies were placed in the winter cases used in former years, four in a case, packed with planer shavings for wintering out-of-doors, and they were located in a portion of the apiary surrounded by a high board fence to shelter them from wind. The remaining colonies, numbering 37, were brought into the bee cellar in the basement of the farm foreman's house on November 3, after they had had a good flight on November 1.

Two shallow rectangular pans, measuring 13 inches by 24 inches, were filled with water and placed on the floor of the cellar to help to humidify the air, but they proved to be of very little value for this purpose. The temperature of the cellar was recorded with a self-registering thermograph placed on a shelf 5 feet 4 inches above the floor. It averaged 49° during December and February and 46·8° in March. During December and January the weather was mild, and to keep down the temperature in the cellar good ventilation was given. March was a very cold month, with deep snow on the ground.

Without showing much restlessness, the bees began to die rather fast in November, and the mortality increased at an accelerating rate. The dead bees were not usually distended, but the mouths of some of the hives were spotted with dysentery.

25 pints of dead bees were swept up on December 15.
34 pints of dead bees were swept up on January 27.
36 pints of dead bees were swept up on February 28.
30 pints of dead bees were swept up on March 13.
12 pints of dead bees were swept up on March 20.
7 pints of dead bees were swept up on March 27.

These figures do not include the dead bees on the bottom-boards of the hives. On the bottom-boards of six colonies that died in February and March the quantity of dead bees amounted to 25 pints.

On February 22 it was noticed that associated with the heavy mortality was a heavy consumption of food, that one colony had already died leaving no stores, and that

several colonies, particularly those in which many bees had died, were very light. As a precaution, all colonies that had weighed less than 55 pounds gross (about 25 pounds of stores) when put away for the winter were given candy made by boiling for a few minutes six pounds of granulated sugar in one and one-eighth pints of water, with one-half teaspoonful of cream of tartar. After boiling, the candy was allowed to stand until its temperature had fallen to about 130° F. It was then stirred vigourously until it whitened, when it was poured into moulds. A moist candy of fine grain, yet sufficiently hard to set well, resulted. On February 28, it was found that in the majority of the colonies the bees had not touched the candy, its surface having hardened, but a few colonies, by burrowing into it, were able to keep in touch with the soft parts and had consumed a little. Three more colonies were found to be dead, one of them having left eleven pounds of desiccated granulated honey in the combs with the cappings torn open. All the colonies were now supplied with candy made as moist as it was safe to make it without its running, and the cellar floor was periodically watered. At the same time certain colonies were removed to one of the cellars in the new Bee building and were occasionally given water, the mortality for each period of twenty-four hours being recorded, with the results shown in the following table:—

TABLE *of Daily Mortality.*—Number of Bees found dead on the floor of each hive at 11 a.m. each day.

DATE.	NUMBER OF COLONY.							
	280.	229.	277.	291.	271.	253.	249.	228.
March 23	33	32[1]	36	87	84	29	33	4
" 24	10	10	57	31	67	10	34	11
" 25	17	8	54[2]	59	80	6	41	7
" 26	15	6	25	42	80[2]	5	41	1
" 27	21[3]	12	15	38	23	11	12	6
" 28	6	13	8	41	11	31	14	2
" 29	0	8	12	59	5	46	25	2
" 30	2	8	13	68	7	135	31	0
" 31	6	10	7	65[4]	19	0	40[2]	1
April 1	2	3	5	.....	11	.....	15	4
" 2	4	2	13	.....	3	.....	4	1
" 3	4	4	18	.....	5	.....	8	1
" 4	4	6	3	.....	7	.....	7	2
" 5	4	4	11	.....	9	.....	6	3
" 6	12	11	30	.....	13	.....	19	15
" 7	9	2	40[2]	.....	21	.....	23	7
" 8	3	5	57[6]	.....	38	.....	15	12
" 9	8	4	38	.....	9	.....	13	5
" 10	9	9	24	.....	10	.....	13	6
" 11	8	10	12	.....	14	.....	19	20
" 12	7	16	11	.....	3	.....	33	8
" 13	12	12	5	.....	22	.....	5	10
" 14	23	24	14	.....	9	.....	47	15
" 15	3	9	2	.....	7	.....	18	2
WEIGHT OF HIVES.								
March 23	40 lb.	33½ lb.	27 lb.	27 lb.	31 lb.	40 lb.	40 lb.	43½ lb
NUMBER OF COMBS COVERED BY BEES.								
April 26	6	1½	2	.....	3	.....	2	3

All brought out of the cellar between 7 and 8 a.m. on April 15.

[1] Water given Mar. 22. [2] Water given. [3] Flight given, bees carried water busily. [4] Colony died, leaving water. [5] Colony dead : granulated honey nearly all uncapped and very dry, left in nine of the combs. [6] More water given.

OTTAWA.

A microscopical examination of the ventriculus and its contents of dying bees from colonies that suffered the most loss did not reveal the presence of any organism to which the mortality might be attributed, and the conclusion was reached that this was due mainly to granulated and unwholesome stores combined with insufficient moisture.

The humidity in the bee-cellar was ascertained with a sling psychrometer[1] at different dates to be as follows:—

Date.	Dry bulb.	Wet bulb.	Relative humidity.
December 31, 1915	46°	40°	59%
January 28, 1916	50°	48°	87[2]%
March 11, 1916	43½°	38°	60%

The volume of the bee cellar, which is boarded off from the main cellar, is 1,206 cubic feet, which gives 22·6 cubic feet per colony.

It was noticed that the relative humidity in the new cellar in the new Bee building was also low and candy given to the bees quickly hardened there too. The following reading was taken:—

Date.	Dry bulb.	Wet bulb.	Relative humidity.
March 22, 1916	42°	36½°	59%

Several other readings, giving about the same relative humidity, were obtained on other days.

When the colonies could be examined in April it was found that in nearly all of them the stores were more or less granulated, and there is strong evidence to show that the presence of granulated and more or less unwholesome stores aggravated the harmfulness of the deficiency in the humidity of the air of the cellar.

On March 20, in a self-contained, cement-walled and cement-floored bee cellar, in the basement of a dwelling house in the city where bees, brought in from the country, were wintering with only a moderate mortality, but candy given was hardening slowly, the reading of the sling psychrometer was as follows:—

Date.	Dry bulb.	Wet bulb.	Relative humidity.
March 20, 1916	46°	42°	79%

The cellar contained 328 cubic feet and 23 colonies, making 14·3 cubic feet to the colony. In spring two of the colonies were found to be dead and one very weak.

On March 30, the bee cellar of Mr. Harley Selwyn, of Kirk's Ferry, Que., 11 miles north of Ottawa, was visited. The cellar contains 1,693 cubic feet and held 132 colonies, giving 12·8 cubic feet per colony. It has a cement floor and walls, and is the basement of an unoccupied building. The bees seemed to be wintering well, with low mortality, with the exception of certain colonies that had starved to death. Water was standing in one or two places on the cellar floor. The readings of the sling psychrometer showed as follows:—

Date.	Dry bulb.	Wet bulb.	Relative humidity.
March 30, 1916	51°	48°	81%

The bees had been wintering on natural stores. No syrup had been given in the autumn, and no marks of dysentery were present on the front of any of the hives

[1] This instrument consists of two accurate thermometers with cylindrical bulbs, mounted side by side on a stem. The bulb of one of the thermometers is covered with thin silk and is dipped into water before use. The bulb of the other thermometer is kept bare and dry. The two thermometers are whirled for a few minutes with the result that evaporation of the water in the jacket covering the wet bulb depresses the temperature of this thermometer according to the dryness of the air.

[2] Floor damp. Dead bees swept up the previous day.

except on those of the colonies that had died. The quantity of dead bees that had accumulated on the floor since Christmas amounted to only 2½ pails. However, less than 100 strong colonies were brought out in April and the number was reduced by uniting to 85. Stores were badly granulated in many cases, and some of the colonies that had died left granulated honey.

Mr. Alfred Denison, President of the Carleton County Bee-Keepers' Association, has also had considerable loss of bees during the past winter in his bee repository situated at Edwards, Ont., the loss in this case being also attributable to granulated stores combined with dryness. The repository consists of a building above ground 13 feet wide, 26 feet long and 6 feet high, with double walls and double roof containing fifteen inches of sawdust. A cement floor was put in the building two years ago, since which date the bees have wintered badly. One hundred and fifteen strong colonies were brought into the cellar last autumn, but they were reduced by death and the uniting of very weak ones to 75 colonies in April when granulated stores were found to be present. The colonies situated near the floor of the building came out stronger than those above. Previous to the putting in of the cement floor the bees wintered well for ten years on a clay floor. It is to be noted, however, that the winters 1914-15 and 1915-16 were also the only winters in which the bees at the Central Experimental Farm wintered so badly. Local weather conditions during these two seasons probably affected the kind of honey stored or the condition of the stores or of the bees and excited the trouble. It must also be remembered that a little of the honey gathered in 1914 probably remained in some of the hives until the winter of 1915-16.

Evidently granulated stores are not a good food for wintering bees, and it seems clear that their availability as food is reduced by a dry atmosphere, that is, one in which the relative humidity is not more than 60 per cent, a degree of dryness that is very common in the cellars of well-built dwelling houses in the interior of Canada in the winter. There is also evidence that air as dry as this is harmful with unwholesome stores that are not much granulated. The source, or sources, of the granulated stores and all the causes of their granulating cannot at present be definitely stated, and will form the subject of further experiment, but it may be remarked that honeys vary in their granulating quality largely according to the different plants from which they are gathered. The principal exciting causes of granulation are agitation of the honey as, for instance, that which takes place during the process of extracting, great and frequent changes in temperature and low temperature. All the common Canadian honeys granulate sooner or later after extraction. Subjecting honey to heat prevents or retards its granulation. Honey that has been liquefied by the application of moderate heat retains the liquid condition longer if the vessel containing it is hermetically sealed. Although evaporation is not a commonly recognized cause of the granulation of honey, yet there is reason to believe that it acts in this way, because it is one of the causes of the crystallization of solutions of other crystallizing substances.

It is profitable at this time to consider the different sources of moisture for bees in the cellar, and how the moisture may be conserved or supplied. The sources of moisture are: (1) The honey, which is separated in the body of the bee into carbon dioxide and water. It has been calculated that average honey, when consumed, produces the same quantity by volume of water. (2) The evaporation through the comb of the stores; this takes place, although slowly, in dry cellars, even where the stores are capped, but in a cellar saturated with moisture the stores may take up water, and if they are uncapped they may take up a large quantity and may ferment. (3) Moisture may pass in through the walls and floor of the cellar. (4) Moisture may come with the air brought in. In winter in the interior of Canada the outside air averages "rather dry." When the air gets warm its relative humidity falls still lower and it becomes very dry. Air entering the cellar from outside has thus a powerful drying effect.

OTTAWA.

Simple and effective ways of checking the escape of moisture from the hive are: (1) Using sealed covers, either the wooden cover sealed down (which, however, absorbs a certain amount of moisture), or a cover of oilcloth. Replacing the covers with bran sacks, as is the practice in many cellars, and has been done in our cellar for many years, permits the escape of much moisture. (2) Reducing ventilation either by contracting the entrance to the hive or reducing the currents of air that pass through the cellar. It is dangerous to reduce ventilation beyond a certain point. (3) Crowding colonies in the cellar. This is important and gives the professional bee-keeper with many colonies an advantage over the beginner, or amateur, with only a few colonies.

Simple and effective ways of supplying humidity are: (1) Having water running from a tap into a drain some distance away in the cement floor of the cellar. (2) Having a sand or earth floor in place of a cement floor; this should be well drained. (3) Deferring the autumn feeding until late, or using thinner syrup than usual. (4) Giving abundant stores so that they will slowly evaporate and give off moisture in the hive if the cellar is too dry. (5) Hanging a division board feeder full of water in each hive. (6) Sprinkling the floor with water periodically. As this requires daily attention, it is applicable only in cases of emergency. In the well-ventilated cement-floored cellar in the new bee building containing 1,600 cubic feet and only forty colonies, the relative humidity was raised from about 60 per cent to almost saturation in a few minutes by throwing two gallons of water on the floor, but the air became dry again within twenty-four hours.

In our Ottawa experiments there have been indications that colonies wintered outside have also suffered from excessive dryness, though to a less extent than in the cellar. Here it may be most conveniently counteracted by the use of sealed covers and the reductions of the size of the entrance to the smallest dimensions. Burial under a moderate depth of snow would tend to supply humidity. Our outdoor wintered colonies were thus buried from March 1 until March 13, and a large cavity was found to have thawed away in front of the entrance when they were dug out on the latter date.

It is, perhaps, advisable to add that excessive dampness in a bee cellar, especially when combined with too low a temperature, is a well-known cause of bad wintering. The evils of excessive dryness are much less widely recognized. Many a bee-keeper, to make the bee cellar as dry as possible, has put in a cement floor, when the bees would have done better with an earth floor.

A contributory cause of winter mortality at Ottawa is the abundance of fall honey flowers, which keep the bees active up to the middle of October, thereby wearing them and shortening their lives. The most troublesome of these is the sweet clover (*Melilotus alba*), which has become very plentiful in vacant lots of late years, and has a peculiar attraction for the bees. The practice of cutting it down early causes it to grow up again and remain in bloom until very late. In 1915 it was in bloom up to November 7. The honey produced by this plant is inferior to clover honey, and the amount obtained for the labour of gathering it in late summer and autumn is too small to be profitable.

The bees were brought out of the cellar on the early morning of a promising day, March 31, with snow still covering the ground. There was no wind and a clear sky. The temperature rose to 49° at noon and 53° at 2 p.m. The bees flew well from 10 a.m. until late in the afternoon, and none got chilled on the snow. They were brought into the new cellar directly after this flight, and they were brought out finally to occupy their permanent stands in the new apiary near the new bee building on April 13. It was noticed that none flew back to the old apiary situated only 250 feet away from which they were removed in November.

The twelve colonies that were wintering outside had good flights between March 25 and April 2, and they flew nearly all day on March 29, 30 and 31. They were brought into the large cellar in the new bee building on April 6, preparatory to placing

them in their new location near the new bee building. Three of these colonies were brought out from the cellar on April 13 and flew freely on the 15th, but during the height of the flight not more than a dozen bees were seen at the old location. The nine remaining colonies were brought out on April 20 and flew freely on April 24th when it was also noticed that not more than a dozen or so of the bees were hovering around the old location. It is, therefore, evident, that not only may bees completely forget the position of their summer stands during the long winter rest, but that colonies of bees that have been flying freely for a day or two in early spring may, after confinement in the hive during a period of two to three weeks, be removed a distance of a few hundred yards, under certain conditions, without loss worth considering. The two locations were separated by a dwelling house and a few trees, up to 30 feet high, some of them evergreens. To bring the bees out of the cellar the entrances were closed with strips of burlap folded four times. After the hives had been placed in position, the entrances were opened by turning back two inches or so of the burlap, the burlap being left in the entrance to protect from cold air and from robbers. Bees should be brought out of the cellar either in the early morning or late in the afternoon, so that when the hives are opened there will be no rush and immediate flight of bees.

The weather was cool during the first half of April with noon temperatures below 60°, but it warmed up on the 24th and the remaining days of this month had noon temperatures between 60° and 70°. The colonies were examined between the 27th and 28th of April. The colonies that had been wintered in the cellar were in a forward condition with much brood, a few young bees having already emerged in the strong colonies, but the colonies wintered outside, although strong, had suffered a set-back in breeding through having been transferred to the cellar and placed outside again without the protection of the wintering cases, and most of their brood was still in the egg and young larvæ stage.

The average number of combs covered by the twenty-eight colonies that had wintered in the cellar was 4·2.

The average number of combs covered by the twelve colonies that had wintered outside was 5·7.

The following table compares the strength of the bees in spring with the loss of weight during the winter in the cellar-wintered colonies. One colony, not included, which covered six combs, was placed in a special protection case packed with shavings and could not be weighed until later.

	Average loss of Weight, Each Colony. Pounds.
Nine colonies that died during the winter	26·44
Nine colonies in which the bees covered up to three combs on April 27, 1916	24·19
Twelve colonies in which the bees covered over three combs up to five combs on April 27, 1916	19·41
Six colonies in which the bees covered over five combs up to seven and a half combs on April 27, 1916	17·33

A considerable loss of weight, due to heavy consumption of stores, is an indication of poor wintering. As the colony weakens the stores are consumed more rapidly and the bees wear out and die more quickly.

OTTAWA.

The following table brings out clearly the advantage of supplementing unsatisfactory winter stores with well-made sugar syrup. The syrup is stored next to the cluster and is, therefore, consumed first and so the accumulation of fæces is delayed.

	Average Weight of Sugar fed per Colony. Pounds.
Nine dead colonies	6·1
Nine colonies with bees covering up to three combs	6·8
Twelve colonies with bees covering over three combs up to five combs	7·59
Six colonies with bees covering over five combs up to seven and a half combs	15·00

Marks of dysentery were noticeable in nearly all the hives in the spring, and those containing colonies that had died out or were very weak were badly soiled with it.

EXPERIMENTAL STATION, CHARLOTTETOWN, P.E.I.

REPORT OF THE SUPERINTENDENT, J. A. CLARK. B.S.A.

In the annual report for the year ending March 31, 1915, will be found a record of the condition of the bees in the spring of 1915, of which the following is an analysis:

ANALYSIS OF WINTERED COLONIES.

	Wintered.	Average loss of Weight per Colony.
		Lbs.
Two colonies dead	Outside	26
Two colonies bees covering 2 to 2½ combs	Outside	23¼
Two colonies dead	In cellar	19¾
Three colonies bees covering 2 to 2½ combs	In cellar	18⅔

The colonies that died left stores of granulated honey. The remaining colonies were weak and did not throw off any swarms until late in the season.

The colonies were removed from the cellar on April 22. The first willow blossom was recorded on April 7, and the first dandelion on May 24.

The following table gives the average loss or gain in weight of a colony, in periods of ten days each, that was set on scales from June 25 to September 1:—

Period.	Loss.	Gain.	Principal Source of Honey.
	Lbs.	Lbs.	
June 25 to July 3		½	Fruit bloom.
July 4 to July 13	2		White clover.
July 14 to July 23		8¼	Alsike clover and white clover.
July 24 to Aug. 2		27½	Alsike clover and white clover.
Aug. 3 to Aug. 12		27	Alsike clover and white clover.
Aug. 13 to Aug. 22		8	Linden bloom.
Aug. 23 to Sept. 1		5	
Total gain		76¼	

Two of the colonies were transferred to 10-frame Langstroth hives. One of these was packed with an 8-frame colony in a packing case filled with shavings. The other was placed with an 8-frame colony in the cellar. One hundred pounds of syrup were fed. The feeding was started September 24 and was finished October 11. The bees were put into winter quarters November 17.

On March 31, 1916, an examination of the colonies was made. No. 2, Langstroth 10-frame colony in outdoor wintering case, was dead, having left a large supply of granulated honey. No. 3, the 8-frame colony beside it seemed in good condition. The two colonies in the bee cellar were in good condition.

In company with the Dominion Apiarist, the Superintendent visited a number of bee-keepers in the vicinity of the Experimental Station on July 19 and 20. On July 21 a visit was paid to six apiaries in Margate, Clinton and North Granville. When well taken care of the bees were producing large quantities of honey. The colonies were strong, and, with one exception, very few losses were reported the previous winter. The varieties in the above-mentioned places were black, Italian and hybrids.

From information gleaned from the bee-keepers, it seems probable that European foul brood was responsible for the decline of the industry for many years. This disease can be controlled, and the prospect for a large increase in this industry in Prince Edward Island is good. The names and addresses of forty-five bee-keepers in the province are on file in the office of the Superintendent.

CHARLOTTETOWN.

EXPERIMENTAL STATION, KENTVILLE, N.S.

REPORT OF THE SUPERINTENDENT, W. SAXBY BLAIR.

The six colonies of black bees that were wintered here in 1914-15 went into their winter cases out-of-doors on November 6, with an average weight of 66·8 pounds per colony. These were removed from their cases on April 13, 1915, when their average weight was 49 pounds per colony, showing that on the average 17·8 pounds of stores had been consumed from November 6 to April 13. Although the colonies had wintered in a healthy condition, there was a shortage of stores, and this, coupled with a very late spring, made feeding necessary. Feeding started on April 14 and continued until May 25, seventy-five pounds of granulated sugar being used throughout the feeding season. This sugar was fed in the form of a syrup made of equal parts by weight of the sugar and water. The mixture was boiled gently and stirred until all the sugar was dissolved. Care was used to prevent the syrup from burning, as the slightest burning proves injurious to the bees.

The summer, although cloudy and wet, was, on the whole, favourable for honey production. September, being without frost until the 26th and unusually bright, enabled the bees to continue their work late in the season. The fruit bloom was above the average, while the clover bloom was exceptionally plentiful. The other honey producing plants,—buckwheat, wild radish, golden-rod, fireweed and knapweed,—were as abundant as in other years.

In spite of the unfavourable weather conditions in the spring and early summer, our six colonies increased to fifteen, with a total honey production for the summer of 559¼ pounds. Swarms were taken on the following dates : June 3, 4, 6, 10 13, 15, 19 and July 2. The largest amount of honey obtained from one colony was 80¼ pounds extracted honey, obtained from the swarm of June 13. The following table gives the production of the colonies and swarms :—

No. of Colony		Wintered Colony or Swarm.		Date of swarming.	Weight of Extracted Honey produced.
1		Wintered		June 3	53½
2		"		" 6	64
4		"		" 19	21¼
6		"		" 4	46½
7		"		" 10	8½
8		"		" 15	12
9		Swarm.	June 3.	July 2	45½
10		"	June 4	July 7	
11		"	" 6		63¾
12		"	" 10		51¾
13		"	" 13		80¼
14		"	" 15		32½
15		"	" 19		43
16		"	" 19		7⅓
17		"	July 2		29¼

All our swarms this season have been put into 10-frame Langstroth hives, and we are gradually doing away with the 8-frame size. Nos. 1 and 2, being weak in the fall,

were united, making 14 colonies in our apiary. Some autumn feeding was done between October 11 and October 16, 23 pounds of sugar being used.

Prices obtained for the honey was 12 cents per pound in tins containing five pounds, and 15 cents in pound jars.

Fourteen colonies were put into winter quarters on November 16. They were wintered outside in cases containing four, two and one colonies each. These cases were large enough to allow a space of two inches to be packed with planer shavings on all sides. The covers were removed from the hives and a super filled with shavings placed on top of the hive, a piece of burlap being tacked over the bottom of the super to prevent the shavings from going down into the hive.

The winter cases were covered with a waterproof roof. Circulation of air was supplied by air holes at the bottom of the cases adjacent to the bee entrance.

KENTVILLE.

EXPERIMENTAL FARM, NAPPAN, N.S.

REPORT OF THE SUPERINTENDENT, W. W. BAIRD, B.S.A.

The weather during March, 1915, was springlike; consequently, the bees were removed from the cellar to the open on the 25th. Unfavourable weather conditions for bees prevailed during the greater part of April, May and the latter part of June. The weather was much more favourable during July and the early part of August. September was cooler and the mornings were foggy. The first storing of honey was noted on July 1 and the last on September 24, as was indicated by the colony which was kept on the scale during the entire season. During July this colony stored 122 pounds, while for August it stored only 25 pounds.

The following table gives the maximum and minimum temperatures and rainfall recorded for the six principal months:

Month.	Highest Shade Temperature.	Minimum Temperature at Night.	Precipitation for Month.
April	62	18	3·29
May	74	26	4·43
June	81	30	3·57
July	81	43	1·95
August	81	39	4·67
September	80	32	1,47
Aggregate, 6 months			19·38
Average, 6 months	76·50	31·33	3·23

From the above table it will be noted that during May, June and August much more rain fell than during July and September.

The growth of clover was excellent throughout the summer; the white or Dutch was not as much in evidence as it was during the season of 1913, the common red prevailing. Notwithstanding the unfavourable weather conditions, a very successful years' work from this apiary can be reported.

The following is a statement of profit and loss from the eight colonies spring count:—

November 1, 5 colonies fit for winter at $5		$ 25 00
1,429 pounds extracted honey at 12 cents		171 48
		$196 48
Interest on stock at 6 per cent	$ 3 90	
Cost of honey containers	14 30	
Cost of sugar for feeding	2 50	
Wages from April 1 to September 25, averaging two hours per day at 17 cents per hour	60 52	
		$81 22
Profit		$115 26

The average production per colony, spring count, was 178·6 pounds. The greater portion of the honey during the season was of a higher quality than that produced in 1914, seventy-five per cent being white honey, much of this from the white or Dutch clover on the marsh, the principal plant upon which the bees were working until August 17. From this date until the 24th of September the honey came from golden-rod, wild aster and white clover, and was lighter in colour than the pure golden-rod honey.

WINTERING RESULTS.

Thirteen colonies were used in the test and housed in the cellar of the superintendent's house. The thirteen colonies were divided into five lots and prepared as follows:—

Two colonies received clover honey (natural stores).

Four colonies received artificial stores consisting of two parts of good granulated sugar to one of water, fed to them through a Miller feeder.

Two colonies received half sugar syrup and half golden-rod honey.

One colony received half sugar syrup and half clover honey.

Four colonies received golden-rod honey only (natural stores).

The following table gives the weights of these colonies when put into the cellar on December 21, 1915, and when they were taken out on April 12, 1916, also condition of each of the latter date:—

Colony No.	Quality of Stores.	Weight, Dec. 21, 1915.	Weight, Apr. 12, 1916.	Loss.	Condition, Apr. 12, 1916.
		Lb.	Lb.	Lb.	
1	Clover honey	53	44	9	Bees covered 6 combs.
2	Clover honey	63	42	21	Bees covered 6 combs.
3	Sugar syrup	55	47	8	Bees covered 4½ combs.
4	Sugar syrup	56	42	14	Bees covered 5 combs.
5	Sugar syrup	54	47	7	Bees covered 5 combs.
6	Sugar syrup	54	40·5	13·5	Bees covered 7 combs.
7	Golden-rod honey	50	38	12	Bees covered 6½ combs; slight dysentery.
8	Clover honey	49	42	7	Bees covered 3½ combs.
9	Golden-rod honey and sugar syrup	59·5	46	13·5	Bees covered 5 combs.
10	Golden-rod honey	56	44	12	Bees covered 6 combs; slight dysentery.
11	Golden-rod honey and sugar syrup	54	45·5	8·5	Bees covered 3½ combs; slight dysentery.
12	Golden-rod honey	51	41	10	Bees covered 4 combs; slight dysentery.
13	Golden-rod honey	55	45	10	Bees covered 3 combs much dysentery.

From the above table it will be noted that in every case where golden-rod was fed dysentery was more or less in evidence, and that slight dysentery was found in No. 13, which was fed partly on sugar syrup and partly on golden-rod honey. Nos. 1, 6, 9 and 13 suffered slight loss by poor ventilation, indicated by mould on the hive. The results coincide with those obtained the previous winter, in that the bees came through the winter in a more healthy condition when fed on sugar syrup. None of the colonies required feeding on the day they were placed in the open.

During the season a demonstration hive was exhibited at all the exhibitions and was the centre of much attraction. It was evident, from the number of inquiries regarding the profitableness of bee-keeping that many more farmers, as well as city people, are becoming interested in bee-keeping.

NAPPAN.

EXPERIMENTAL STATION, FREDERICTON, N.B.

REPORT OF THE SUPERINTENDENT, W. W. HUBBARD.

The early part of the season, on account of the wet and cold, was very unfavourable for the apiary. The season improved considerably later. Seven hives were put into wintering cases in the fall of 1914 for wintering outside. The wintering cases were made to take four hives each with packing material, and were in an enclosed yard sheltered from wind. All the colonies wintered well with the exception of No. 3, which upon examination was found to have died, leaving 12 to 15 pounds of granulated honey. Swarming was very troublesome during the entire season. Four swarms were hived and the rest were returned to the respective hives from which they issued. No. 10 colony gave the highest yield of honey with 102½ pounds to its credit, while No. 2 produced no surplus. The average yield from the ten colonies was 36·9 pounds.

Eight colonies were put into the wintering cases and two into the bee house for winter, and, while complete examination has not yet been made owing to weather conditions, it is feared that three or four colonies have succumbed.

SESSIONAL PAPER No. 16

EXPERIMENTAL STATION, STE. ANNE DE LA POCATIÈRE, QUE.

REPORT OF THE SUPERINTENDENT, JOS. A. BEGIN.

Forty colonies, placed in our well ventilated cellar at the end of November, 1914, were put out on April 14, 1915. Wintering in the cellar was on the whole satisfactory.

We noticed that the most populous colonies wintered best and consumed least stores in proportion to the population.

Four colonies were wintered outside in a wintering case made of tongued and grooved boards an inch thick. The four hives were protected at the sides by about three inches of dry oat chaff placed between the hives and the case, and above by the oat chaff eight to nine inches deep placed in bags. The bees wintered in this case consumed less stores than those wintered in the cellar. Their average loss of weight was only 10½ pounds per colony, while those that wintered in the cellar lost 16½ pounds per colony. It is only fair to say, however, that the winter of 1914-15 was mild, while a heavy rain in January flooded the bee cellar with twelve inches of water for twenty-four hours and was the means of lowering the temperature considerably for several weeks, as we were forced to give excessive ventilation to dry the cellar.

The spring of 1915 was so late, damp and cold that the bees remained in their hives five days out of seven from the date they were brought out until the 20th of May. All plants flowered about ten days later than usual; in consequence the spring ingathering was small and soon over.

The first spring examination was made on the 8th, 9th, and 10th of May, when all the colonies were found to be in good condition, the bees of each colony covering on the average 3·57 combs.

The weak colonies were united after the first spring examination. In this way the number of colonies was reduced from 44 to 38.

To guard against swarming, we prevented the bees from becoming crowded in any of the hives by adding half-depth or full-depth supers, according to their needs. During the swarming season the colonies were examined every six to ten days, according to the state of the weather, and all queen cells were destroyed. In spite of these precautions eight out of the thirty-eight colonies swarmed. Five of the swarms were returned to the parent colony and three were hived on separate stands and united to weaker colonies at the end of the honey flow.

While we were able to prevent swarming in great measure by giving the bees room and destroying the queen cells, yet it seemed that certain colonies were incurably addicted to this fault. Some of the very strong colonies did not swarm at all, while others that were weaker and were given the same liberal room swarmed. Detailed notes have been made of the tendency to swarm of the different colonies in order to find out if the colonies will retain this tendency in the future.

PRODUCTION OF HONEY IN 1915.

The year 1915 was regarded by the bee-keepers of this district as an average one for the production of honey. Considering the very short duration of the honey flow the season was fairly good with us. The principal sources of nectar are dandelion, alsike and white clover. White clover is unfortunately not very abundant in the district,

and fruit trees, which are not plentiful here, supply but little nectar. Late in the season, such plants as Canada thistle and golden-rod, furnished nectar for the maintenance of the bees.

The total production of the apiary in 1915 amounted to 2,686 pounds of honey of every kind, classified as follows,—165 pounds of yellow honey from dandelion produced previous to the 26th of June, 2,060 pounds of white honey from alsike and white clover produced in July up till the 8th of August, and 461 pounds of amber honey produced partly from clover and partly from golden-rod and other plants during August up till the 6th of September. The average price obtained for the honey was 13¾ cents per pound.

A colony of average strength was selected and placed on tested scales so as to show the daily gain in weight from the 1st of June until the 31st of August. A swarm from a strong colony was successfully united with this colony on the 16th of June. This made the colony stronger than any of the rest in the apiary. In consequence, its gain was greater than the average. It gained 91 pounds, while the average yield for the rest of the apiary was 61 pounds per colony.

Stated below are the details of the gain and loss of this colony between the 1st of June and the 31st of August. It will be noticed that the greatest gains for single days were 8½ pounds on July 14, 8½ pounds on July 15, 8 pounds on July 16, 6½ pounds on June 28 and 6 pounds on July 5.

Date.	Lb.	Gain.	Loss.	Maximum Temperature.
				°
June 1	59			71·1
" 2	62	3		54·2
" 3	62½	½		72·0
" 4	63	½		77·4
" 5	65	2		74·1
" 6	68	3		79·4
" 7	69½	1½		80·2
" 8	71	1½		75·2
" 9	71			66·4
" 10	71½	½		60·3
" 11	71½			58·1
" 12	71½			70·4
" 13	71		½	72·2
" 14	70½		½	70·1
" 15	70		½	75·6
" 16	79A		½	75·1
" 17	91B			69·2
" 18	91½	½		66·7
" 19	81C		½	82·1
" 20	81½	½		74·2
" 21	82	½		65·3
" 22	83	1		60·0
" 23	83			46·0
" 24	82½		½	54·2
" 25	82		½	63·1
" 26	83½	1½		70·0
" 27	86½	3		67·8
" 28	93	6½		74·6
" 29	95	2		69·0
" 30	98½	3½		79·0
July 1	97		1½	59·0
" 2	95		2	64·6
" 3	96	1		65·5
" 4	97	1		79·1
" 5	103	6		79·8
" 6	102		1	65·0
" 7	100		2	73·4
" 8	102	2		66·1
" 9	100		2	69·7
" 10	100			80·5
" 11	100			89·5
" 12	104½	4½		78·1

STE. ANNE DE LA POCATIÈRE.

Date.	Lb.	Gain.	Loss.	Maximum Temperature.
				°
July 13	110	5½	.....	78·2
" 14	118½	8½	.....	81·2
" 15	127	8½	.....	77·1
" 16	135	8	.....	70·6
" 17	135½	½	.....	67·8
" 18	133	.....	2½	62·8
" 19	138	5	.....	74·8
" 20	142½	4½	.....	70·3
" 21	147	4½	.....	72·1
" 22	152	5	.....	77·6
" 23	157½	5½	.....	76·4
" 24	160½	3	.....	80·4
" 25	164	3½	.....	72·1
" 26	162½	.....	1½	72·9
" 27	165½ D	3	.....	80·6
" 28	102	.....	3½	83·0
" 29	165½	3½	.....	77·3
" 30	106	½	.....	83·6
" 31	108½	2½	.....	85·4
Aug. 1	108	.....	½	77·4
" 2	109	1	.....	61·4
" 3	106½	.....	2½	73·6
" 4	107	½	.....	71·8
" 5	107	.....	.....	75·3
" 6	106 E	.....	½	78·9
" 7	80e	.....	1½	62·4
" 8	80	.....	.....	70·7
" 9	80	.....	.....	57·6
" 10	80	.....	.....	72·4
" 11	79½	.....	½	81·4
" 12	79½	.....	.....	84·2
" 13	78½	.....	1	79·7
" 14	78	.....	½	74·5
" 15	77½	.....	½	70·6
" 16	78	½	.....	75·5
" 17	78	.....	.....	66·9
" 18	78	.....	.....	61·2
" 19	77½	.....	½	69·8
" 20	77	.....	½	75·4
" 21	77	.....	.....	80·4
" 22	77	.....	.....	74·4
" 23	77	.....	.....	73·4
" 24	77	.....	.....	76·8
" 25	77	.....	.....	71·8
" 26	77	.....	.....	67·5
" 27	76½	.....	½	59·2
" 28	76½	.....	.....	67·5
" 29	76½	.....	.....	61·9
" 30	76	.....	½	66·9
" 31	76	.....	.....	61·9

Average maximum temperature: June 69·0°, July 73·9°, August 71·1°.

A A light swarm added June 16th.
B One super added June 17th.
C Ten pounds of honey extracted.
D Sixty pounds of honey extracted.
E Twenty-five pounds of honey extracted.

While the average daily gain in June amounted to 1·8 pounds and in July to 2·3 pounds, there was a loss in August of 0·2 pounds in spite of the favourable temperature. The shortness of the honey flow is clearly shown; there were no substantial gains after the end of July.

The greatest yield for one colony was 116 pounds, and the smallest 46 pounds. After the honey flow we united the weak colonies and thus reduced the apiary to 34 good colonies for wintering. The colonies weighing less than 55 pounds were fed in October and all had plenty of stores for winter. The bees were brought into the cellar between November 18 and 24.

STE. ANNE DE LA POCATIÈRE.

EXPERIMENTAL STATION, CAP ROUGE, QUE.

REPORT OF THE SUPERINTENDENT, GUS. A. LANGELIER.

Races kept.—The bees kept at this Station are Italians, hybrids and the common blacks.

Hives.—The hives used are all 10-frame Langstroth.

Bee cellar.—The bee cellar, under the Superintendent's house, is 19 feet 8 inches long by 9 feet 6 inches wide and 6 feet high. The floor is of concrete, and the ceiling and walls are well insulated with three inches of shavings. The ventilation is of the Rutherford type. There are no mice in this cellar. The average temperature during the winter of 1915-16 was between 44° and 45° F.

Wintering results, 1914-15.—On November 14, 1914, fourteen colonies were placed in the cellar. The average weight per hive was 63·6 and they ranged from 56 to 76 pounds. Twelve colonies were taken out alive on April 21, 1915. The average weight per hive was 46 pounds, a loss of 17·6 pounds during the winter. The average number of combs covered by bees on April 26 was 4½.

Bee pasturage.—Bee pasturage is limited because the Station is bounded on the south by the St. Lawrence river, which is nearly two miles wide at this spot, and on the north by the forest. Willows showed their first blossoms on April 23, whilst dandelion was fully out by May 20. White clover and alsike were in bloom from June to August. Reference may also be made to a plot, 0·6 acre in extent, of raspberries, currants and gooseberries situated near the apiary. Buckwheat followed, lasting up to September.

Honey produced in 1915.—The total production of honey was 520 pounds of extracted honey and 50 sections; the average per colony, spring count, was 49·6 pounds.

Colour and flavour of honey.—About half of the honey was white and of finest quality, apparently from alsike and white clover, one quarter white but of not as good quality, whilst the remainder was light amber of pleasant flavour, probably from wild flowers and buckwheat.

Price realized.—The average price realized for honey was 15·24 cents per pound. Most of it was sold in five pound pails, but the Quebec market calls for a smaller and neater package, such as the one-pound glass jar.

Hive on scales.—A hive was placed on scales at the beginning of the season and remained there all the time. The largest increase in one day was ten pounds on July 14, when the maximum temperature was 78° F. in the shade and the weather cloudy at frequent intervals. The period of largest increase was between July 11th and 19th inclusive, during which time the weight of the hive went up from 72 to 102 pounds. After the honey was extracted on August 6, the hive weighed 68 pounds. After that date it never increased more than two pounds during one day; it reached its highest weight, 80 pounds, on September 4, and then gradually decreased to 76 on the 20th.

Exhibitions.—Two observation hives of bees were included in the exhibit from this Station at Three Rivers, at Quebec and at four county shows. It is not exaggerating to say that these attracted more people than anything else. An observation hive was also

kept in the Poultry Administration Building all summer and it interested visitors very much, at the same time affording a chance to the man in charge to give information about better methods of bee-keeping to the farmers and other visitors.

Difficulties encountered.—The main difficulty encountered was the loss of many young queens at mating time after swarming. In August five colonies were found to be queenless.

Wintering results 1915-16.—On November 16, 1915, sixteen colonies were placed in the cellar. The average weight per hive was 60 pounds, and they ranged from 48 to 76 pounds. Thirteen colonies were taken out alive on April 12, 1916. The average weight was 44·75 pounds, a loss of 15·25 pounds during the winter. The average number of combs covered by bees on April 20 was 4⅙. The cause of the loss of the three colonies during the winter was probably unwholesome stores. Four of the colonies that survived had exhausted their stores and two had granulated honey.

The following table gives the details about the colonies which survived the winter:—

Colony No.	Weight, Nov. 16, 1915.	Weight, Apr. 12, 1916.	No. of Combs covered by bees.	Approximate pounds of stores.	Condition.
	Lb.	Lb.			
1	54	38	3	0	No eggs or brood. Queen seen.
2	60	44	4	4 to 5	No eggs or brood. Queen seen.
3	55	48	5	6 to 8	Eggs and larvae.
4	53	41	3	3 to 4 (candied honey)	Eggs.
11	76	56	7	12 to 14	Eggs.
12	56	52	4	10 to 12	Eggs and larvae.
13	64	41	5	0	Eggs.
14	65	45	5	5 to 6 (candied honey)	Eggs and uncapped brood.
21	67	47	8	4 to 5	Brood in all stages.
22	63	44	2	5 to 6	No eggs or brood. Queen seen.
23	69	42	3	0	Eggs.
24	63	38	3	0	No eggs or brood. Queen seen.

NOTE.—A queenless colony, not included, was united to another.

CAP ROUGE.

EXPERIMENTAL FARM, BRANDON, MAN.

REPORT OF THE SUPERINTENDENT, W. C. McKILLICAN, B.S.A.

In presenting the following report on the work with bees at this Farm, I wish to give credit to my Assistant, Mr. W. H. Hicks, B.S.A., who has had general supervision of the work, under my direction, and who has done most of the work of preparing the report.

Of the twenty-six colonies of bees placed in the cellar of the Superintendent's residence in November, 1914, all were taken out in April alive and in good condition, averaging in weight 36½ pounds. Four colonies had been placed in an outside wintering case in November, 1914. One of these colonies was strong, two were of medium strength, and one was weak. The weak one and a medium colony died during the winter. The other two survived. Their average weight when removed from the wintering case was 34½ pounds. These two and the twenty-six wintered in the cellar made a total of twenty-eight colonies on hand at the commencement of the season of 1915.

The chief object of the apiary work on this Farm during the last few seasons has been to increase the number of colonies and to make it a distributing centre for the western Farms. This policy is not conducive to a heavy honey crop. It has, therefore, been decided to decrease the size of the apiary here and try to get a larger honey production per colony. With this object in view five 10-frame Langstroth hives have been purchased. These hives are more roomy than the 8-frame ones which have been in use previously. The larger hives will enable the apiarist to more easily control swarming, and by so doing increase honey production. The 8- and 10-frame hives will be compared in this respect during the season of 1916.

In June, 1915, one colony of bees was supplied to the Lacombe Station, one to Lethbridge and two to Indian Head. In July three colonies were sold locally for $7.50 each. On August 7, colonies No. 32 and No. 4 were considered too weak for wintering, so were united. During the season six new swarms were hived. This left a total of twenty-six colonies on hand on November 12, 1915, when the hives were placed in winter quarters. Four of these colonies, with an average weight of 57 pounds, were placed in the same outside wintering case used the previous season, with this difference, that planer shavings were used for packing instead of cut straw. The remaining twenty-two colonies, with an average weight of 63 pounds per hive, were stored in the cellar of the new poultry administration building. This cellar was well supplied with moisture and the temperature was good. During the month of February, with an outside minimum temperature of 36° and a maximum of 41°, the room in the cellar where the bees were had a minimum of 40° and a maximum of 45°. All colonies wintered well considering the very severe winter. Those wintered outside were quite active on March 30, which was a bright warm day.

On September 18 all the colonies were weighed to see if they were well supplied with stores for the winter. Twelve were considered too light. One hundred pounds of syrup, consisting of two parts sugar and one part water—by measure—was fed with the Miller feeders to these twelve colonies. This put them in good condition for winter.

During the season of 1915, 200 pounds of extracted honey were sold at 16 cents per pound, and 70 pounds of comb honey at 20 cents per pound. Besides this amount one hundred pounds are still on hand in extracting frames, and if not needed for feeding weak colonies in the spring will be extracted. This is not as much honey as should have been obtained from so many colonies, but considerable difficulty in pre-

16-1916-78a.



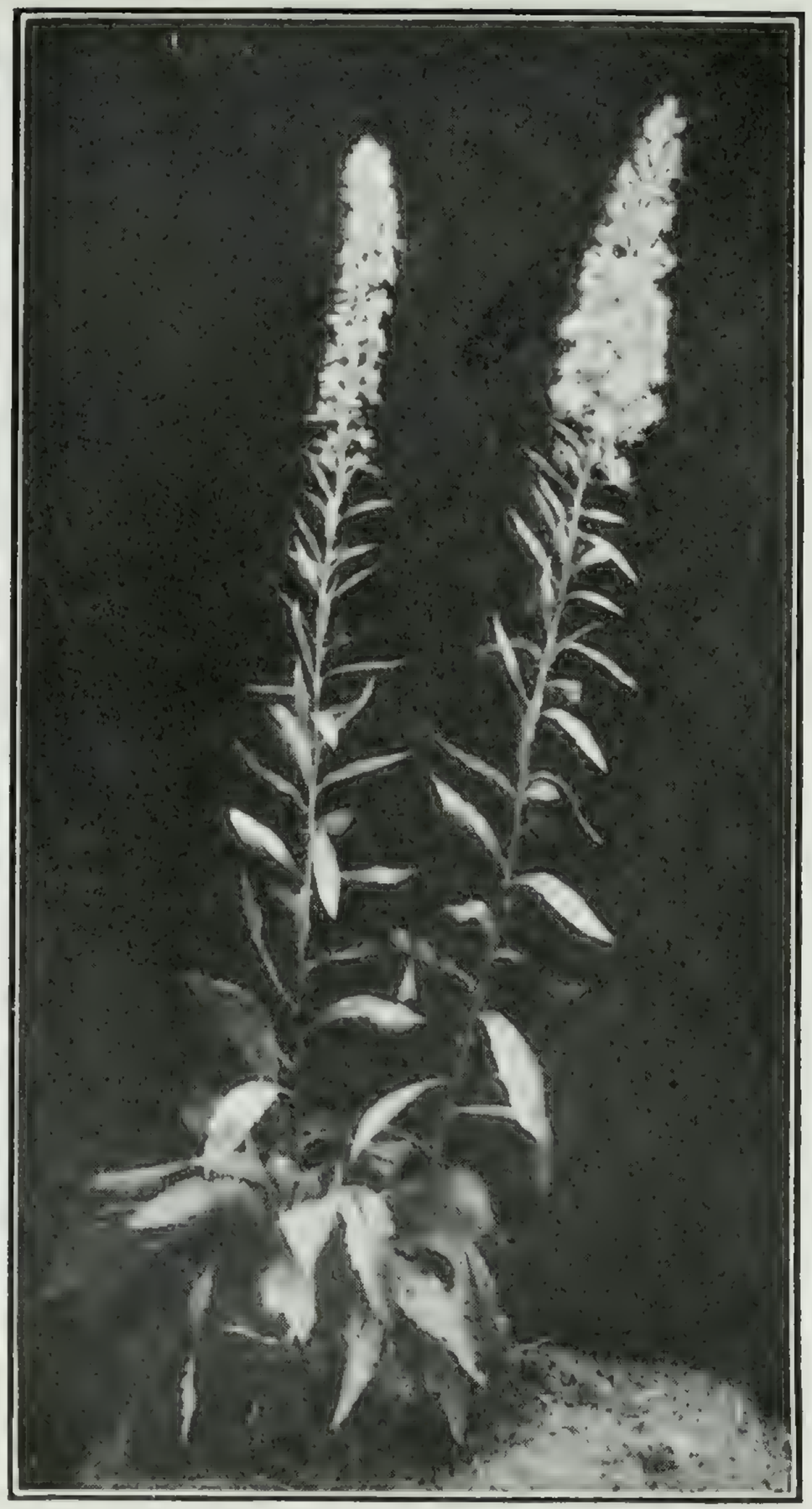
C. E. F., Ottawa. Apicultural Building. View from S. E.



Cap Rouge, Que. Bees are never wicked when swarming.



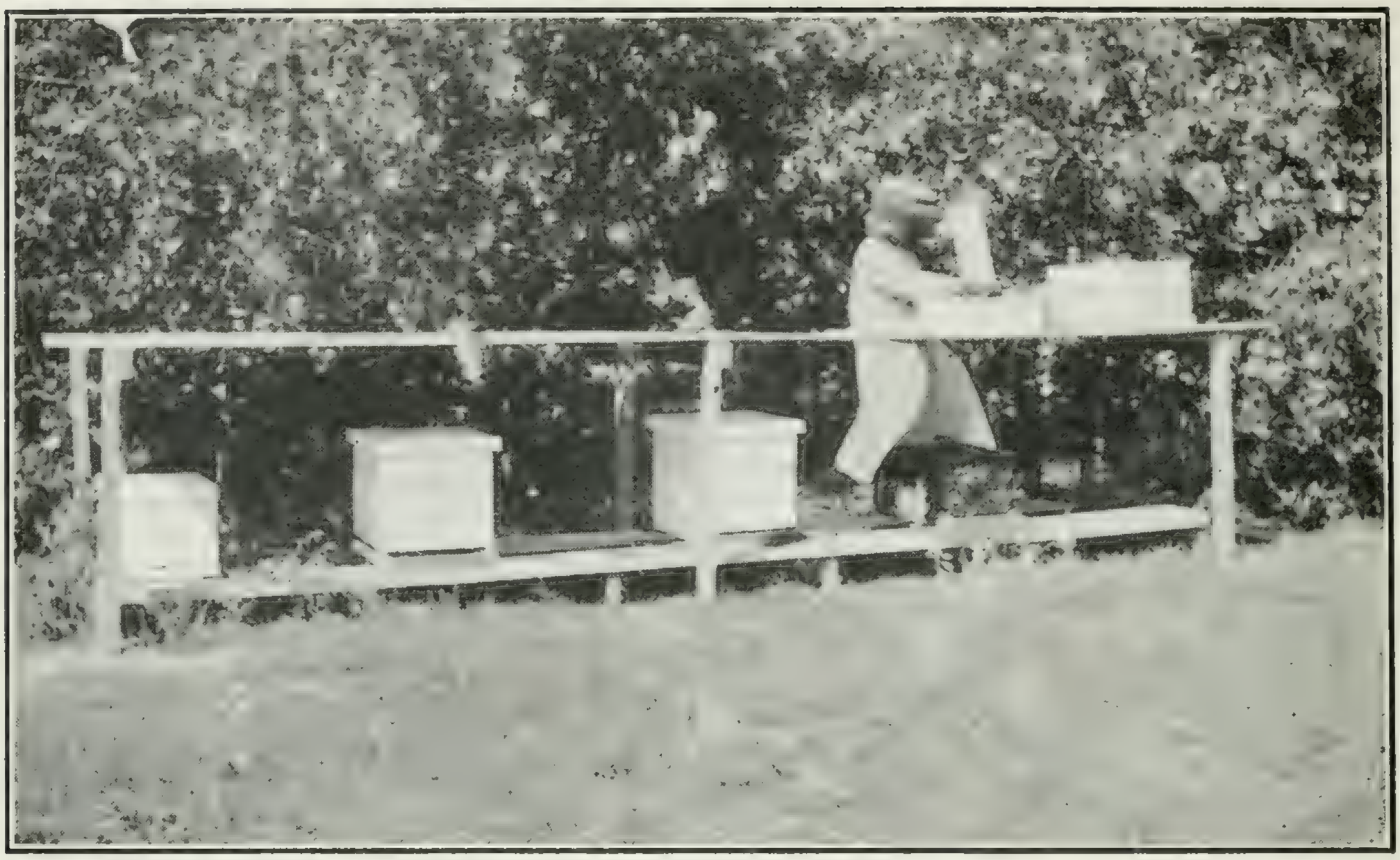
Searching for the queen.



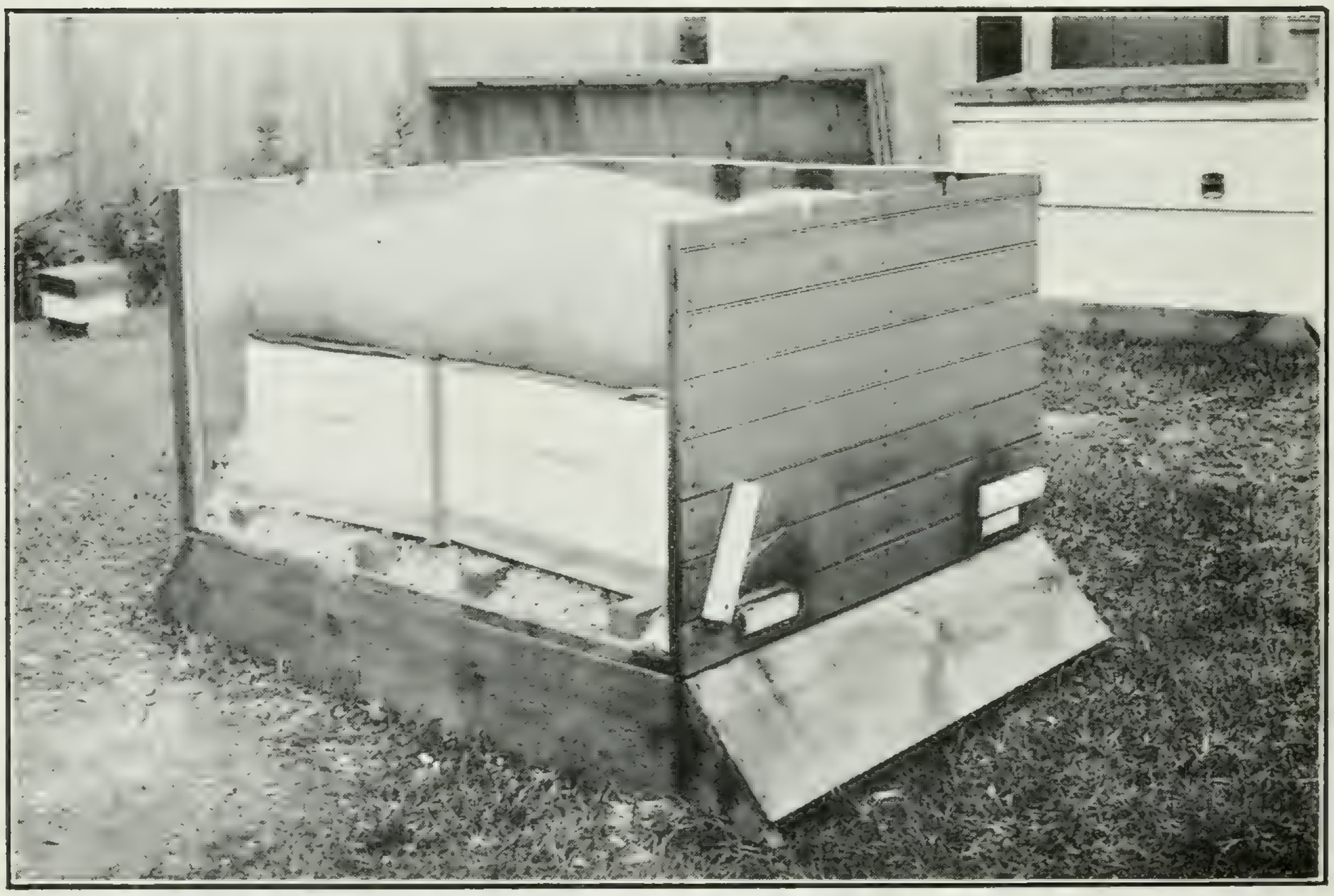
Solidago puberula.



Solidago Squarrosa.



Summer view of bee-hives showing shade.



Wintering case for four hives.

venting swarming had to be dealt with. The season also was very unfavourable for honey production. It is thought that with fewer colonies, in larger hives, given more attention, better results will be obtained during the coming season.

On June 22 a colony was placed on scales and registered a weight of 65 pounds. The weight was taken twice daily, at 7 a.m. and 7 p.m., throughout the summer. On June 30 it had increased to 70 pounds. On July 8 it was 76 pounds. A super was then added, increasing the weight to 94 pounds. By July 13 another pound had been added, and on this date 4 pounds were extracted, leaving the weight at 91 pounds. For the next week there was a gradual decrease in weight, and on July 20 the weight was only 89 pounds. Then, by the 25th, the weight had increased again to 94 pounds, and on that date the colony threw off a swarm.

On August 1 a different colony was placed on the scales. It weighed 107 pounds. By August 18 it was up to 118 pounds, but from then it decreased and increased at different intervals, till, on August 30, it weighed only 114 pounds.

The highest gain in any one day was 3 pounds, on August 3. That day had a minimum temperature of 38·5° and a maximum of 74°. There were eleven hours of bright sunshine and a south wind, with a velocity of approximately five miles per hour. On August 2 the gain was 2 pounds. It was also a bright day, with eleven hours of sunshine. There was a gentle breeze blowing from a southerly direction.

Whenever there was a decrease in weight it nearly always occurred during the night. However, on four different days in the two months the evening weight was one pound less than the morning weight. On August 25, which had only six hours of sunshine, with a minimum temperature of 35° and a maximum of 60°, with a northeast wind blowing twenty miles per hour, the hive lost one pound in weight between 7 a.m. and 7 p.m. On August 30, with ten hours of sunshine, a minimum of 47° and a maximum of 91° and a northwest ten-mile an hour wind, the hive also lost a pound in the daytime.

Thus clear, warm, calm weather appears to be more conducive to honey production than cool, cloudy or windy weather.

EXPERIMENTAL FARM, INDIAN HEAD, SASK.

REPORT OF THE SUPERINTENDENT, W. H. GIBSON, B.S.A.

In the fall of 1914 two colonies were put in the cellar. The bees came through the winter in good condition. On March 22 the hives were taken from the cellar and placed on their stands, an outer covering being placed over each for spring protection.

During the season an apiary house was built in which to keep stores, etc. The apiary increased from two to eight colonies, including two received on June 15 from Brandon. The honey production for the season totalled 163 pounds, which was put up in five-pound pails and sold at 22 cents per pound.

The principal honey plants in this district are willows, dandelion, *Caragana,* white Dutch clover, alfalfa, golden-rod, aster, etc. The *Caragana* is a good honey plant and produces honey of a light colour.

The colonies are examined periodically throughout the season in order to ascertain the general condition of the hives, and to prevent natural swarming by cutting out the queen cells. On May 5 the hives were examined by the Dominion Apiarist, and found to be in good condition. On September 17 the supers were taken off, Miller feeders were substituted and sugar syrup fed. On October 7 the feeders were taken off and the colonies weighed. Nos. 3, 4, 7 and 8, being weak, were united to make two colonies of full strength. Outer covers were put on as a protection. The bees were put in the cellar on November 10. A record was kept of the temperature in the cellar throughout the winter, the maximum temperature being 52° F. and the minimum temperature 30° F., the average temperature for the winter being 42° F.

EXPERIMENTAL STATION, LETHBRIDGE, ALTA.

REPORT OF THE SUPERINTENDENT, W. H. FAIRFIELD, M. S.

The results from the apiary during the summer of 1915 were very encouraging and suggest that the possiblities in bee-keeping in the alfalfa districts in Southern Alberta are very much greater than has yet been realized. It has generally been considered that the prevalence of high winds during so great a part of the season would prove to be a serious detriment to the bees during the period when they were collecting honey, but our experience would indicate that this is not as much of a hindrance as might be expected. In the spring of 1915 the apiary consisted of two colonies in 8-frame hives. They had been wintered in a dry well-ventilated 12 foot by 12 foot "dugout" cellar, having been put in their winter quarters on November 17, 1914, at which time they weighed respectively 72 pounds and 65 pounds each. On March 31, 1915, they weighed 57 pounds and 50 pounds, respectively. On the following day they were removed from the cellar and placed on their summer stands in a somewhat sheltered place, but no further protection was given them.

Spring Examination.—On May 25 a thorough examination was made. No. 1 hive had about 5½ combs covered with bees, but apparently the queen had met with some mishap, for with the exception of about one hundred emerging bees, there was no brood in the hive and a virgin queen was observed. As the stores consisted only of about one pound of new uncapped honey, it was thought advisable to add both stores and brood to the hive, so two frames containing brood in all stages and one frame with about two pounds of capped honey were taken from hive No. 2 and given to it. No. 2 hive, when examined on this date, was found to contain 7½ frames covered with bees. There was about five pounds of capped honey and six of the combs contained brood in all stages. The queen was seen and her wings clipped. About the first of June both colonies were transferred to 10-frame hives.

Increase.—As it was desired to increase the apiary no super was added to No. 2 hive so that in their crowded condition they attempted to swarm on June 25, but the swarm returned to the hive on account of the queen's wings having been clipped. On the following day the colony was divided artificially. Two new 10-frame hives were taken and into each was put four frames containing brood and covered with bees. At least one queen cell was observed. The new hives were then filled out with frames of foundation comb and removed to a place about one hundred yards distant. The entrances were stopped up with grass and allowed to remain so for nearly two days. The old colony was thus left with the queen and but two frames of brood. Three frames of empty comb were put in and the balance of the hive filled out with frames of foundation. The two new colonies thus made were designated as Nos. 3 and 4. Although No. 1 hive was given plenty of super room it swarmed on July 18. The swarm was put in an 8-frame hive. This was afterward known as No. 5. From this time on, weekly examinations were made during the rest of the season, the principal object in view being to prevent any further swarming by destroying all active queen cells found. On June 25, a colony of bees was received from the Brandon Experimental Farm. These arrived in bad shape and died during the summer.

Sources of honey.—The chief source of honey is alfalfa, which commences to bloom about the middle of June and continues in bloom until killed by frost in September. There is some white clover, but the quantity is quite limited. The bees were observed working on some of the native prairie plants, but the real source of supply is without doubt the alfalfa which is grown in such large areas on the irrigated land hereabouts. During the summer a hive was placed on scales and a daily record kept of the weight, and it was found that the greatest average daily gains were made in August. The highest yield came on dry hot days when there was not much wind.

Honey production.—The honey crop from each colony during the season was as follows:—

Hive No. 1	85¾	pounds extracted honey.
" No. 2	76¾	" " "
" No. 3	15	" and 46 one pound sections.
" No. 4	54¼	"
" No. 5	50½	"

Yield of two colonies (spring count) for season of 1915:—

351 pounds extracted honey (one section counts as 1½ pounds extracted) at 18 cents	$63 18
3 swarns at $5	15 00
Total	$78 18
Average value of produce per colony	$39 09
" weight of extracted honey per colony ..pounds.	175·5

Preparation for wintering.—An inspection made September 6, showed that all the colonies contained queens and that there were eggs as well as brood in all stages present. All the colonies were fed during the latter part of September. The syrup used was composed of two parts of granulated sugar and one part of water and the amounts supplied were as follows:—

Hive No. 1	..pounds.	12
" 2	"	9
" 3	"	20
" 4	"	14
" 5	"	12

The final examination was made on October 3, and no brood or eggs were seen at this time. On November 9 the bees were moved into their winter quarters. Hives Nos. 1, 2 and 5 were put in the cellar, while Nos. 3 and 4 were put in cases to be wintered outside. The winter cases were made of one inch lumber giving room for one foot of packing material at the bottom and 6 inches at the sides and 18 inches on top. The packing material used was cut straw and chaff.

The weights of the hives at the time of placing them in winter quarters and their weights and general condition when removed March 31, 1916, are as follows:—

Hive.	Where Wintered.	Weight of Hives, Nov. 9, 1915. Lbs.	Weight of Hives, Mar. 31, 1916. Lbs.	Frames Covered with Bees, Mar. 31, 1916.	Estimated Amount of Stores, Mar. 31, 1916. Lbs.
No. 1.	In cellar	62	46	8	4
" 2.	In cellar	62	52	5	7
" 3.	Outside	72	50	4	10
" 4.	Outside	68	56	1	15
" 5.	In cellar	68	64	6	4

The bees which were wintered in the cellar, being free from dysentery and strong, were in a much better condition in the spring of 1910 than those wintered in wintering cases outside which had suffered to some extent from dysentery and were in a much weaker condition.

LETHBRIDGE.

EXPERIMENTAL STATION, LACOMBE, ALTA.

REPORT OF THE SUPERINTENDENT, G. H. HUTTON, B.S.A.

Although the season of 1915 was not altogether favourable for the production of honey owing to the large number of rainy or cloudy days, a fairly good showing was made by the four hives of bees at this Station. The snow was melted on the ground by March 20, and the first willow blossoms were out April 12, while dandelion followed, being in full bloom April 24. The honey-flow began about May 28 and continued until September 2. From records kept of the honey production in hive No. 3 a daily increase of from one to two pounds was observed during the greater part of July and August. The returns from the apiary were very creditable and it would appear that bee-keeping can be safely followed as a side line, and may even become profitable as a commercial undertaking.

Two colonies wintered in splendid condition in a room in the cellar of the office, where the window was removed and heavy burlap tacked over the opening to allow free circulation of air and yet keep the room dark. This room may be heated by opening a door leading to the furnace room, and was so manipulated in 1915 that the temperature ranged from 30° F. to 50° F. and only on one or two occasions, when the temperature was lower than 40° below zero outside, did the room temperature fall to 30° F. A third colony died during the winter of 1914-15, due to insufficient supplies. A prime swarm was hived from hive No. 1 on July 2 and was in good condition in the fall after having produced about 25 pounds of extracted honey. A hive of bees was received from Brandon June 17, which gave the second largest crop of honey obtained from any one hive during the season.

The following table gives the yield of extracted honey from the various hives:—

	Lb.	Oz.
Colony No. 1 (wintered)	16	11
" No. 2 (swarm from No. 1, July 2)	25	2
" No. 3 (wintered)	63	11
" No. 4 (from Brandon)	27	10
Total crop of honey	133	2
Average per hive	33	4½

The following table shows in detail the daily weather conditions and variation in weight of one hive at the Lacombe Station during the summer of 1915:—

Date.	Weight of Hive on scales at 7 a.m.	Gain.	Loss.	Shade temperature at noon.	Minimum temperature previous night.	Sky during day (clear, occasional clouds, frequent clouds, or cloudy).	Wind.		Rainfall during 24 hours in Inches.
							Direction, (N, S, E, or W., NW., SW., SE., N.E.)	Force: Still, Light air, Breeze, Strong Breeze, Gale.	
	Lb.			°	°				
May 20	43			58	34·9	Clear	E.	Light air	
" 21	43·1	0·1		59	43·9	Cloudy	E.	"	
" 22	43·1			62	48·9	"	SE.	"	
" 23	43·5	0·4		51	42·9	"	SE.	"	
" 24	43·5			50	38·4	"	SE.	"	0·03
" 25	44	0·5		52	49·4	"	NE.	"	0·17
" 26	44			56	40·9	Clear	N.	Breeze	0·7
" 27	44			59	49·4	"	N.	"	
" 28	45	1·0		70	37·9	Cloudy	W.	Light air	0·25
" 29	45			68	40·1	Clear	W.	"	
" 30	44·5		0·5	66	42·7	Fr. clouds	E.	"	0·02
" 31	44·5			66		"	E.	S. breeze	
June 1	46	1·5		69	50·9	Cloudy	E.	"	0·19
" 2	46			62	46·9	"	E.	"	2·20
" 3	47	1·0		58	44·9	"	SE.	"	0·38
" 4	48			66	34·9	"	SE.	Light air	
" 5	48			65	43·9	"	N.	"	
" 6	49·5	1·5		68	35·9	"	E.	Breeze	
" 7	50	0·5		69	39·4	Cloudy	SE.	"	
" 8	51	0·1		72	43·4	"	SE.	"	0·66
" 9	53	0·2		70	35·9	"	SE.	"	0·30
" 10	53			71	41·4	"	S.	"	0·15
" 11	54	1		68	39·9	"	S.	Light air	0·2
" 12	56	2		68	37·9	"	S.	"	0·8
" 13	57	1		66	31·9	"	SE.	"	
" 14	58	1		64	42·9	"	SE.	"	
" 15	60	2		70	37·4	"	SE.	"	
" 16	60			62	38·9	"	SE.	Breeze	
" 17	61	1		64	43·9	"	SE.	"	
" 18	62	1		63	39·4	"	S.	"	
" 19	64	2		65	32·9	Clear	S.	Light air	
" 20	64			68	34·9	"	SE.	"	
" 21	64			71	43·9	"	N.	"	
" 22	63		1·0	70	48·9	O. clouds	W.	Breeze	
" 23	63			70	42·9	"	W.	"	
" 24	63·5	0·5		71	38·4	Fr. clouds	N.	"	
" 25	64	0·5		62	49·4	"	NW.	S. breeze	
" 26	65	1·0		61	49·9	"	NW.	"	
" 27	65			73	40·9	Clear	S.	Light air	
" 28	65			68	37·9	"	SE.	"	
" 29	66	1·0		62	40·0	"	S.	"	
" 30	66			70	40·9	"	S.	Breeze	
July 1	66·5	0·5		66	41·4	Cloudy	N.	"	
" 2	66·5			71	41·4	Clear	E.	Light air	
" 3	67	0·5		73	34·9	"	W.	"	
" 4	67			73	42·9	"	W.	"	
" 5	68	1·0		71	41·4	"	NW.	"	
" 6	69	1·0		69	50·9	Cloudy	E.	S. breeze	
" 7	69			73	43·9	"	E.	"	0·06
" 8	99*			70	43·9	"	SE.	Light air	0·05
" 9	100	1·0		66	41·4	Clear	E.	"	0·76
" 10	101	1·0		71	46·9	"	S.	"	0·15
" 11	101·5	0·5		71	47·9	"	S.	Breeze	
" 12	103	1·5		73	44·9	"	S.	Light air	0·01
" 13	105	2·0		64	46·9	Cloudy	NE.	Breeze	0·01
" 14	106·5	1·5		58	48·9	"	S.	"	0·9
" 15	107	0·5		59	45·9	"	E.	"	0·17

* Super given.

LACOMBE.

Date.	Weight of Hive on scales at 7 a.m.	Gain.	Loss.	Shade temperature at noon.	Minimum temperature previous night.	Sky during day (clear occasional clouds, frequent clouds, or cloudy).	Wind.		Rainfall during 24 hours in Inches.
							Direction (N., S., E. or W., NW., SW., SE., NE.)	Force: Still, Light air, Breeze, strong Breeze, Gale.	
	Lb.			°	°				
July 16..	107			54	48·9	Cloudy....	NE.	Breeze.....	.....
" 17..	108	1·0		62	47·1	"	S.	Light air...	0·2
" 18..	108·5	0·5		69	46·9	Clear.....	S.	" ...	0·04
" 19..	110	1·5		71	46·9	" ...	S.	" ...	0·04
" 20..	111	1·0		66	42·9	"	SE.	S. breeze....	.....
" 21..	112	1·0		74	47·9	"	S.	" ..	0·32
" 22..	114	2·0		70	54·9	Clear.....	W.	Light air...	0·07
" 23..	115	1·0		59	40·9	Cloudy...	NE.	Windy.....	.....
" 24..	115			76	54·9	Clear	W.	S. breeze....	.....
" 25..	118	3·0		67	44·9	Clear	S.	Light air..	.....
" 26..	120	2·0		69	46·4	"	S.	" ...	.....
" 27..	123·5	3·5		73	44·9	"	SE.	" ..	.....
" 28..	126·5	3·0		70	49·9	"	W.	" ...	.....
" 29..	129	2·5		74	48·1	"	S.	" ...	.....
" 30..	132	3·0		73	43·9	"	SW.	" ...	.....
" 31..	134	2·0		78	48·9	"	S.	" ...	.....
Aug. 1..	136	2·0		75	43·9	Cloudy.....	NW.	Breeze.....	.....
" 2..	139	3·0		80	52·9	Clear	S.	" ...	0·21
" 3..	140	1·0		84	44·9	"	S.	Light air..	.....
" 4..	142	2·0		86	45·4	"	SE.	" ...	.....
" 5..	145	3·0		80	49·9	"	W.	" ...	.....
" 6..	147	2·0		82	50·9	"	W.	Breeze.....	.....
" 7..	150·5	3·5		77	50·9	Cloudy.....	SE.	" ...	.....
" 8..	154	3·5		66	56·3	"	W.	Light air.	.....
" 9..	156	2·0		86	56·4	Clear	S.	" ..	.....
" 10..	159	3·0		87	50·4	"	S.	" ...	.....
" 11..	172*			84	53·2	"	N.	" ..	.....
" 12..	185·5*			70	54·6	Cloudy.....	NE.	S. breeze...	.....
" 13..	187	1·5		74	.....	Clear.....	SE.	" .	.....
" 14..	188·5	1·5		80	.....	O. clouds..	SE.	" .	.....
" 15..	190	0·5		80	.....	" ...	SE.	Breeze.....	.....
" 16..	190·5	0·5		78	.....	" ...	SE.	S. breeze...	.....
" 17..	192·5	2·0		78	.....	" ..	SE.	" .	.....
" 18..	194	1·5		77	.....	Cloudy.....	N.	Breeze ..	.. 0·4
" 19..	194·5	0·5		74	.....	"	N.	"	.....
" 20..	195·5	1·0		72	.....	"	NE.	Light air.	.....
" 21..	196	0·5		76	.....	Clear.....	S.	Breeze.....	.....
" 22..	196			74	.....	"	NE.	"	.....
" 23..	196·2	0·2		72	.....	"	SE.	S. breeze...	.....
" 24..	197·5	1·3		55	.....	Cloudy....	NE.	Breeze.....	0·04
" 25..	196		1·5	76	.....	Clear.....	S.	"	.....
" 26..	196			74	.....	"	SE.	"	.....
" 27.	196			67	.....	O. clouds..	N.	S. breeze...	.....
" 28..	195·5		0·5	72	.....	Clear.....	S.	" .	.....
" 29..	195		0·5	80	.....	"	S.	Breeze.....	.....
" 30..	195			78	.....	Cloudy.....	S.	"	.....
" 31..	195			78	.....	Clear.....	.....	.....	.....
Sept. 1..	195			75	.....	"	.....	.....	0·06

* Super given.

LACOMBE.

EXPERIMENTAL STATION, INVERMERE, B.C.

REPORT OF THE SUPERINTENDENT, G. E. PARHAM, B.S.A.

The season's work commenced with eleven colonies. The new situation for the apiary, well protected from the prevailing high winds on a knoll at the bottom of Toby Creek gorge, has proved most satisfactory. Here, in spite of the high winds, the bees were able to work well, and in May stored a surplus of honey, probably gathered from the bearberry (*Arctostaphylos uva-ursi*) commonly known in this part as "Kinnikinnik." June was a wet month and there was only a slight honey flow, probably from clover and sainfoin principally. Most of this honey was collected during the latter half of the month. The intervening days were cloudy and showery and the bees were kept at home. July gave very little honey, probably owing to the weather conditions. During this month the bees dwindled considerably and were restless, partly owing to the attacks of wasps, hornets and butcher flies. August gave a little dark honey from the 6th to the end of the month, and this kept the queens laying.

At Mr. Sladen's request an out-apiary was started at Mr. J. Johnston's ranch, situated about 1,000 feet above this station. This ranch is most favourably located, being sheltered and surrounded by luxuriant vegetation and plants favoured by bees. Two colonies were taken to this ranch on May 26, No. 10, in a single-walled hive, and No. 11, in a double-walled hive. No. 11 was the stronger colony, and to equalize them two combs of brood were removed from this hive and placed in No. 10, so that both colonies started with brood on eight combs. The weather on the whole was unfavourable for honey gathering throughout their sojourn there. Here, too, the wasps proved most troublesome. On July 24, thirty pounds of very fine honey gathered from unknown sources was extracted from hive No. 11. The two hives were brought back to the Experimental Station on September 22. In hive No. 10 the bees covered seven combs, with brood in all stages, and had about 20 pounds of honey. In hive No. 11 the bees covered eight combs thickly with brood in all stages, and they had about thirty pounds of honey, not all sealed, as they were still working a little on a second crop of clover.

The total amount of honey taken from all the hives during the season was as follows:—

	Pounds.
Extracted honey, No. 1 grade	263
" " No. 2 grade	62
Comb-honey	5

an average of 30 pounds per hive. All the honey sold at 20 cents per pound.

In order to ascertain the amount of honey gathered each day, a hive was placed on scales on June 21. It showed the following variations:—

Date.	Weight.	Gain.	Loss.
	Lb.	Lb.	Lb.
June 21	108		
" 22	117	9	
" 23	122	5	
" 24	124	2	
" 25	120		4
" 26	120		
" 27	120		
" 28	125	5	
" 29	128	3	
" 30	129	1	
July 1	129¼	¼	
" 2	129½	¼	
" 3	130	½	
" 4	132¾	2¾	
" 5	133	¼	
" 6	134½	1½	
" 7	135	½	
" 8	134½	½	
" 9	134		½
" 10	133		1
" 11	132¾		¼
" 12	132½		¼
" 13	132		½
" 14	131½		½
" 15	131		½
" 16	130		1
" 17	129½		½
" 18	129		½
" 19	128½		½
" 20	103	25 pounds honey extracted from seven combs.)	
" 21	103		½
" 22	102½		½
" 23	101½		1
" 24	101½		
" 25	101		½
" 26	101		
" 27	102	1	
" 28	101½		½
" 29	101¼		¼
" 30	93½	(Empty super re-	
" 31	93½	moved.	
Aug. 1	93		½
" 2	93		
" 3	92¾		¼
" 4	92½		¼
" 5	92		½
" 6	92½	½	
" 7	92½		
" 23	92¾	¼	
" 24	93¼	½	
" 25	93½	¼	
" 26	93		½

Autumn feeding commenced on September 21, and continued until October 5. Sixty pounds of sugar were used. The syrup was supplied through Miller feeders.

On November 17 five colonies were placed in the basement of the Foreman's cottage; four in double-walled hives, packed with 1½ inches of dry moss, were left outside, and two were placed in a wintering case, a plan of which was supplied by Mr. Sladen, Central Farm, Ottawa. In the latter dry moss was also used as the packing material. The moss was six inches thick around the sides and nine inches thick on top.

Wintering results.—One of the colonies in the basement died. It had been placed near the wall and had got damp. Of the other four wintered indoors three came out in fair condition and one in good condition. They were brought out on March 10. Two of those in double-walled hives with 1½ inches packing were dead, showing that in a severe winter such as we have experienced the protection was insufficient. The two in the wintering cases wintered the best. This, therefore, appears to be the most satisfactory plan of wintering for our conditions. These two colonies had a cleansing flight on February 14 and 15, although snow was still on the ground. On account of the late spring there was a scarcity of pollen, and, as a substitute, barley chop was placed on a sunny bank. The bees apparently appreciated it.

Mr. R. Sainsbury, who is in charge of the bees, in addition to doing the work on the Station and in the out-apiary, has been the means of stimulating an interest in the keeping of bees in the immediate district, with the result that several ranchers have started bee-keeping. A building 12 feet by 14 feet has been erected in our apiary, and has considerably facilitated the bee work.

The bee section of the Dominion Farms exhibit, which was taken to many of the local fall fairs, created much interest. It included a collection of honey plants gathered locally and bees in an observation hive, together with models of bee appliances.

INVERMERE.

EXPERIMENTAL FARM, AGASSIZ, B.C.

REPORT OF THE SUPERINTENDENT, P. H. MOORE, B.S.A.

All the seven colonies wintered in 1914-15 survived, and three swarms were hived during the season of 1915. Several colonies became queenless after swarming and, although they were requeened more than once, the new queens were killed. Our bees are hybrids; it seems to be partly owing to this fact that the queens were so often killed. However, in June we succeeded in introducing Italian queens to several colonies.

The season of 1915 was a very poor one for honey production. The only considerable flow was at the end of April from the maple bloom. The variety contributing most largely to this flow was the Broad-leaved or Coast maple (*Acer macrophyllum*). There was hardly any clover honey, but a small amount of honey came in from fireweed (*Epilobium angustifolium*) and golden-rod. The seven colonies produced 200 pounds of maple honey and 78 pounds mixed honey, an average of 39·7 pounds per colony.

During the flow from maple bloom, the brood combs became much clogged with pollen and honey, and several colonies swarmed and lost their queens. The result was that too few bees were reared to take advantage of the clover flow in July, which was also reduced by unfavourable weather.

In the autumn the number of colonies was reduced to seven and they were fed 125 pounds of syrup, made of two parts of sugar to one part of water, by weight, and all had a sufficient store of food for winter. They were left on the summer stands, and each was protected by an extra case which had proved very satisfactory the previous year. The winter was very cold and long, and we had the misfortune to lose three colonies.

At the opening of spring all the colonies had plenty of food so that up to the date of writing, March 31, no feeding has been necessary.

EXPERIMENTAL STATION, SIDNEY, B.C.

REPORT OF THE SUPERINTENDENT, LIONEL STEVENSON, M.S.

The collecting of nectar in small quantities opened early in March, 1915, and then was checked by wet, cool weather during April. The succeeding months were very favourable for the development of flowering plants, and the bees had an opportunity of obtaining considerable honey.

The original colonies that were secured for this Station consisted of the common native black bees that in the distant past probably had an infusion of Italian blood. The work of these bees was not very satisfactory, so it was decided to introduce a tested Italian queen. The queen was introduced into one of the queenless colonies in late July. In September we were able to exhibit a case of her progeny at the exhibitions. This colony of Italians wintered better than any of the colonies of natives.

The colonies all wintered out of doors, the only protection given being a chaff cushion placed over the quilt in a six-inch bottomless box, which telescoped over the upper chamber, and was covered with a waterproof, ventilated roof. They all survived the hard winter, but six of the ten colonies were weak when the first flights took place in March 1916. This experience indicates that increased protection for the winter would be advantageous and it would be well to enclose each hive in an outer case.

The apiary was moved early in March to a new stand near the poultry building. The moving was carried out without loss or trouble. The colonies devoted to extracted-honey production gave only two swarms and yielded a total of 148 pounds of honey. The largest amount produced by a single colony was 41½ pounds. The largest daily gain for the hive that was on the scales was 4 pounds 8 ounces on June 29. With the exception of a gain of 3½ pounds between August 12 and 16, almost the whole crop was obtained between May 31 and July 5.

The total amount of granulated sugar fed was 30 pounds.

The total number of colonies at close of the year was eleven. All honey gathered was of somewhat dark colour, probably due to the mixture of the nectar of the flowers of many plants.

The following is a list of honey plants upon which the bees were seen to be working, with the dates of flowering:—

Name of Plant.	Began to bloom.	Full bloom.	Bloom over.
Acer macrophyllum	March 18	March 30	April 20.
Aster	July 20	August 16	September 31.
Anchusa	April 19	May 7	August 22.
Blackberry	May 6	May 20	July 16.
Fruit bloom	March 31	April 6	April 30.
Fireweed	June 2	July 10	August 1.
Golden-rod	June 28	July 12	August 6.
Lavender	June 12	June 25	August 1. Cut.
Mignonette	June 26	July 12	October 15.
Rubus	April 10	May 5	June 10.
Raspberry	May 5	May 14	June 16.
Salix (Willow)	February 6	March 12	March 22.
Snowberry	May 27	June 8	August 15.
Sunflower	July 10	August 6	October 10.
Dandelion	January 30	March 27	April 16.
Wild raspberry	April 26	May 12	June 3.
White clover	April 27	June 1	July 15.
Yellow suckling clover	April 10	June 1	June 28.

DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE
DOMINION EXPERIMENTAL FARMS

REPORT

FROM THE

DIVISION OF FORAGE PLANTS

For the Year Ending March 31, 1916

PREPARED BY

The Dominion Agrostologist, Central Farm, Ottawa. - - - - M. O. Malte, Ph.D.

Superintendent:—

Experimental Station, Charlottetown, P.E.I. - - - - - - J. A. Clark, B.S.A.
Experimental Farm, Nappan, N.S. - - - - - - - - - - W. W. Baird, B.S.A.
Experimental Station,, Kentville, N.S. - - - - - - - - W. Saxby Blair.
Experimental Station, Fredericton, N.B. - - - - - - - W. W. Hubbard.
Experimental Station, Ste. Anne de la Pocatière, Que. - Joseph Bégin.
Experimental Station, Cap Rouge, Que. - - - - - - - - G. A. Langelier.
Experimental Station, Lennoxville, Que. - - - - - - - J. A. McClary.
Experimental Farm, Brandon, Man. - - - - - - - - - W. C. McKillican, B.S.A.
Experimental Farm, Indian Head, Sask. - - - - - - - W. H. Gibson, B.S.A.
Experimental Station, Rosthern, Sask. - - - - - - - - W. A. Munro, B.A., B.S.A.
Experimental Station, Scott, Sask. - - - - - - - - - M. J. Tinline, B.S.A.
Experimental Station, Lethbridge, Alta. - - - - - - - W. H. Fairfield, M.S.
Experimental Station, Lacombe, Alta. - - - - - - - - G. H. Hutton, B.S.A.
Experimental Station, Invermere, B.C. - - - - - - - - G. E. Parham.
Experimental Station, Summerland, B.C. - - - - - - - R. H. Helmer.
Experimental Farm, Agassiz, B.C. - - - - - - - - - - P. H. Moore, B.S.A.
Experimental Station, Sidney, B.C. - - - - - - - - - - Lionel Stevenson, M.S.

Experimentalist, Substation at Fort Vermilion, Alta. - - - Robert Jones.

REPORT FROM THE DIVISION OF FORAGE PLANTS.

OTTAWA, March 31, 1916.

The Director,
Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith the fourth annual report of the Division of Forage Plants for the year ending March 31, 1916.

The work of this division is progressing satisfactorily and a number of results obtained especially during the past year will, I trust, prove of interest and value to farmers of the Dominion.

During the year special attention has been paid to the problem of field root seed growing in the Dominion, and in consequence experiments have been carried out with root seed raising not only at the Experimental Farm, Ottawa, but also at various stations in Eastern Canada and British Columbia.

The breeding work with grasses and various leguminous forage plants which has been in progress since the inauguration of the division is progressing very satisfactorily. It is especially well advanced with alfalfa and timothy, and the results obtained so far decidedly indicate that new real varieties of these forage plants will be ready within the very near future.

I beg to take the opportunity to express here my great appreciation of the very valuable assistance rendered in the work within the scope of the division by Mr. F. S. Browne, B.S.A., Assistant to the Dominion Agrostologist.

I have the honour to be, sir,
Your obedient servant,

M. O. MALTE,
Dominion Agrostologist.

CENTRAL EXPERIMENTAL FARM, OTTAWA.

REPORT OF THE DOMINION AGROSTOLOGIST, M. O. MALTE, Ph.D.

INDIAN CORN.

A number of varieties of Indian corn were tested as usual with a view to securing data bearing on the comparative value of the varieties for ensilage.

The land on which the variety tests were carried out was a good, medium loam which had been in clover sod the previous year. It was originally intended for field roots and was prepared accordingly. It was ploughed in August, 1914, and barnyard manure applied at the rate of 20 tons to the acre.

It was disced and drag-harrowed throughout the fall, and, just before frost, ploughed again. This last ploughing was about nine inches deep and left the land well set up. In the spring of 1915 it was ploughed early, disced and drag-harrowed.

The seed was sown on May 20 in hills three feet apart each way and the plants thinned to four stalks in the hill. The land was cultivated about every ten days up to the middle of August, when the height of the corn prevented further horse cultivation. Being clean and rather free from weeds it was hand-hoed only once after horse cultivation had ceased. Harvesting took place September 22.

A total of eighteen varieties was tested. Of these eight were grown in duplicate plots. The others were tested in single plots, the chief reason for this being lack of suitable land.

The following varieties which are all known as good ensilage varieties that can, almost always, be depended on for good yield and fine quality of ensilage were tested in duplicate plots:—

INDIAN CORN for Ensilage.

Number.	Variety.	Stage of Maturity.	Height in inches.	Yield per Acre.				Average yield per acre.	
				First Plot.		Second Plot.			
				Tons.	Lb.	Tons.	Lb.	Tons.	Lb.
1	Compton's Early	Glazed.....	102	20	1,800	20	800	20	1,300
2	Wisconsin No. 7.....	Med. dough to glazed..	120	19	1,100	21	800	20	1,000
3	White Cap Yellow Dent	" " " ..	108	18	800	21	600	19	1,700
4	Early Longfellow.....	Late dough to glazed .	108	21	1,000	17	1,400	19	1,200
5	Bailey.....	Med. dough to glazed..	120	18	500	19	1,700	19	100
6	Golden Glow.	" " " ..	114	19	300	18	500	18	1,400
7	Salzer's North Dakota	Glazed.....	114	18	1,100	15	1,500	17	300
8	Salzer's North Dakota	Late dough to glazed..	96	16	700	15	—	15	1,350
	Average.....	.....		19	163	18	1,425	18	1,794

In order to obtain a comparison as to the cob production of the above varieties, the cobs and husks were stripped from the stalks at the time of harvest and weighed. The weights obtained thereby are as follows:

INDIAN CORN for Ensilage.

Number.	Variety.	Yield of Cobs per Acre.					
		First Plot.		Second Plot.		Average.	
		Tons.	Lb.	Tons.	Lb.	Tons.	Lb.
1	Compton's Early	7	400	7	300	7	350
2	Wisconsin No. 7	7	900	7	1,000	7	950
3	White Cap Yellow Dent	6	500	7	600	6	1,550
4	Early Longfellow	6	1,300	5	1,300	6	300
5	Bailey	6	500	6	500	6	650
6	Golden Glow	7	400	7	500	7	450
7	Salzer's North Dakota	6	—	5	100	5	1,050
8	Salzer's North Dakota	5	500	5	—	5	250
	Average	6	1,100	6	787	6	943

In the following table are given the yields of six varieties, grown in single plots. Of the six varieties the Argentine Yellow was the latest and consequently produced the poorest quality of ensilage. In 1914, it was the heaviest yielder on the Farm with regard to gross tonnage, but failed to reach the proper stage for ensilage. From experiences so far, it can therefore not be recommended for ensilage in this district.

INDIAN Corn for Ensilage.

No.	Variety.	Stage of Maturity	Height in inches.	Yield per Acre.			
				Cobs.		Total.	
				Tons.	Lb.	Tons.	Lb.
1	Leaming	Soft dough to hard dough	131	6	1,500	21	.....
2	Essex Dent	Med. dough to glazed	108	7	500	20	900
3	King Philip	Late dough to glazed	103	6	1,500	19	600
4	Argentine Yellow	Milk to soft dough	122	3	1,800	18	1,300
5	North Western Dent	Glazed	108	7	100	18	500
6	Howie	Med. dough	116	6	1,200	17	800
	Average			6	767	19	350

The varieties mentioned in the following table are all sufficiently early to produce ripe grain in an average season. Their yield is, however, low from an ensilage standpoint and none of them can therefore be recommended for ensilage in this district. They may be grown to advantage in districts farther north where the ensilage varieties proper mentioned in the first table, fail to reach the right stage of maturity.

OTTAWA.

The grain yield of the varieties is recorded in the following table:—

INDIAN Corn for Grain.

Variety.	Stage of Maturity.	Yield per Acre.	
		Bush.	Lb.
Quebec No. 28	Glazed to ripe	62	36
Gehu	Ripe	55	40
Canada Yellow	Ripe	48	44
Free Press	Ripe	47	16
Average		53	34

FIELD ROOTS.

VARIETY TESTS.

The land used for the variety tests with field roots was, on the whole, similar in character to that allotted to the experiments with Indian corn. It was in clover sod in 1914 and handled previous to seeding as described for Indian corn.

Immediately before seeding it was ridged up into low drills which were then raked down with a hand rake and further flattened by the roller on the seeder.

As soon as the crop was up it was wheel-hoed. Otherwise cultivation was the same as for corn, the only difference being that it ceased sooner. About the middle of August all roots were hand-hoed to check weeds.

All varieties were threatened by cutworms in the early part of the season. The pest was, however, successfully controlled, a mixture of bran and Paris green being applied wherever signs of cutworm injury were observed in the field.

TURNIPS.

A total of thirty-three varieties of turnips were tested, including twenty-seven varieties of swede turnips and six of fall turnips.

All varieties were sown on May 26 at the rate of four pounds to the acre. Germination was good and a perfect stand was obtained. The roots were thinned during the last week of June to about 10 inches and came along in splended condition. At the middle of August, however, all varieties were badly attacked by aphis, the result being that what promised to be a crop above average was reduced to about two-thirds of a normal crop. The violent attack of the aphis also weakened the plants and made the roots more susceptible to infection by fungus diseases. The weather also being very rainy during the latter part of the growing season, the result was that all varieties were affected by soft rot to such an extent that, at harvesting time, October 20 to 27, a large number of roots were rotting in the ground. The crop was therefore harvested in a poor condition.

This accounts for the fact that the keeping quality, on the whole, was very poor. The roots were pitted outside and kept through the winter under conditions which in previous years have proven quite satisfactory, but, in spite of all care taken, the losses from rotting in the pits were great.

OTTAWA.

Swede turnips.—Twenty-seven varieties were tested and yielded as follows:—

SWEDE TURNIPS.—Test of Varieties.

YIELD PER ACRE.

No.	Variety.	1st Plot.		2nd Plot.		Average.		% Dry Matter.	Dry Matter Per Acre.
		Tons. Lb.	Bu. Lb.	Tons. Lb.	Bu. Lb.	Tons. Lb.	Bu. Lb.		Tons. Lb.
1	Hall's Westbury	26 1,500	891 40	24 1,200	820 00	25 1,350	855 50	11·58	2 1,946
2	Lapland, N.S.	23 500	775 00	23 800	780 00	23 650	777 30	11·41	2 1,323
3	Best of All	23 1,400	790 00	25 700	845 00	24 1,050	817 30	10·57	2 1,184
4	Magnum Bonum	25 1,700	861 40	26 1,400	890 00	26 550	875 50	9·42	2 [illegible]
5	Good Luck	25 200	836 40	22 1,000	750 00	23 1,600	793 20	10·33	2 917
6	Hartley's Bronze Top	21 1,700	728 20	23 1,700	795 00	22 1,700	761 40	10·6[illegible]	2 [illegible]
7	Pajbjerg Bangholm	24 1,500	825 00	28 700	945 00	26 1,100	885 00	9·18	2 874
8	Olsgaard Bangholm	25 300	838 20	22 200	736 40	23 1,250	787 30	10·22	2 829
9	Carter's Imperial	23 100	768 20	19 1,100	651 40	21 600	710 00	11·25	2 792
10	Corning's Lapland	22 1,000	730 00	22 1,700	761 40	22 1,350	755 50	10·52	2 771
11	Canadian Gem	22 [illegible]	746 40	26 1,300	8[illegible] 20	24 1,050	817 30	9·4[illegible]	2 [illegible]
12	Weibull's Bangholm	19 1,000	650 00	22 1,500	691 40	20 250	670 50	11·51	2 633
13	Empress	25 100	835 00	22 1,700	761 40	23 1,900	798 20	9·56	2 579
14	New Century	22 [illegible]	746 40	21 200	703 20	21 1,500	725 00	10·45	2 [illegible]
15	Skirving's	18 1,000	616 40	20 500	675 00	19 750	645 50	11·56	2 479
16	Derby	23 700	778 20	18 1,100	618 20	20 1,900	698 20	10·40	2 358
17	Carter's Prize Winner	23 00	766 40	21 1,500	725 00	22 750	745 50	9·42	2 215
18	Shepherd's Golden Globe	19 1,500	658 20	21 100	701 40	20 [illegible]	680 00	9·90	2 [illegible]
19	Halewood's Bronze Top	17 1,400	590 00	18 200	603 20	17 1,800	596 40	10·48	1 1,752
20	Kangaroo	17 200	570 00	24 600	810 00	20 1,400	690 00	8·77	1 1,651
21	Jumbo	17 700	578 20	17 200	570 00	17 450	574 10	10·33	1 1,559
22	Durham	19 00	633 20	18 1,000	616 40	18 1,500	625 00	9·40	1 1,[illegible]
23	Perfection	17 1,000	593 20	19 700	645 00	18 850	614 10	9,38	1 1,456
24	Hazard's Improved	18 [illegible]	613 20	16 00	533 20	17 400	573 20	10·02	1 1,447
25	Bangholm	15 100	516 40	18 1,000	616 40	17 00	566 40	10·06	1 1,420
26	Weibull's Ostersundom	11 [illegible]	380 00	14 00	466 40	12 1,400	423 20	6·00	1,521
27	Weibull's Century	10 700	345 00	8 00	266 40	9 350	305 50	7·87	1,433
	Average	20 1,496	691 36	20 1,929	698 4[illegible]	20 1,712	695 12		2 [illegible]10

FALL TURNIPS.

Fall turnips.—Six varieties of fall turnips were tested. On the whole, they proved far inferior to the swedes as far as yields are concerned. While the average yield of the swede turnips was 20 tons 1,712 pounds per acre, the fall turnips yielded at an average of only 12 tons 1,483 pounds to the acre, *i.e.* about 60 per cent of the yield of the former.

FALL TURNIPS.—Test of Varieties.

YIELD PER ACRE.

No.	Variety.	1st Plot.		2nd Plot.		Average.		% Dry Matter.	Dry Matter per Acre.
		Tons. Lb.	Bu. Lb.	Tons. Lb.	Bu. Lb.	Tons. Lb.	Bu. Lb.		Tons. Lb.
1	Weibull's Swedish Smooth	22 1,000	750 ..	17 1,700	595	20 350	672 30	10·09	2 71
2	Fynsk Bortfelder	19 700	645 ..	13 600	443 20	16 650	544 10	6·53	1 132
3	Greystone	14 1,800	496 40	12 1,000	416 40	13 1,400	456 40	7·73	1 118
4	Danish Yellow Tankard	11 900	381 40	8 ..	266 40	9 1,450	324 10	7·81	1,519
5	Weibull's Pedigree Bortfelder	11 500	375 ..	10 1,000	359 ..	10 1,750	332 30	6·63	1,442
6	Dale's Hybrid	7 100	235 ..	4 50[illegible]	141 40	5 1,300	188 20	8·16	922
	Average	14 833	480 33	11 133	368 53	12 1,483	424 43		1 3,411

OTTAWA.

MANGELS.

Thirty-six varieties of mangels were under test. They were sown May 14 at the rate of 8·5 pounds to the acre. They were thinned the second week of June to about 10 inches apart in the rows. All varieties made a splendid growth and were free from attacks of diseases. The season being, on the whole, favourable for the growth of mangels, the result was that a crop exceptionally high for the district was harvested. The varieties were pulled from October 4 to October 8, and gave an average yield of 36 tons 1,157 pounds to the acre.

However, on account of the wet season, the roots were somewhat soft, and, as a consequence, the keeping quality was slightly affected.

In the following table are given the yields of the different varieties tested:—

MANGELS.—Test of Varieties.

YIELD PER ACRE.

No.	Variety.	1st Plot.		2nd Plot.		Average.		% Dry Matter.	Dry Matter. per Acre.	
		Tons. Lb.	Bu. Lb.	Tons. Lb.	Bu. Lb.	Tons. Lb.	Bu. Lb.		Tons.	Lb.
1	Taaroje	41 400	1,373 20	41 400	1,373 20	41 400	1,373 20	13·00	5	712
2	Svalof Alfa	46 500	1,541 40	49 400	1,640 00	47 1,450	1,590 50	9·84	4	1,392
3	Danish Sludstrup	42 300	1,403 20	41 600	1,376 40	41 1,400	1,390 ..	10·11	4	332
4	Yellow Leviathan	47 700	1,578 20	38 1,300	1,288 20	43	1,433 20	9·17	3	1,886
5	Mammoth Yellow Intermediate	42 700	1,411 40	34 1,700	1,611 40	38 1,200	1,286 40	10·02	3	1,735
6	Gate Post	36 1,200	1,220 ..	30 300	1,005 ..	33 750	1,112 30	11·41	3	1,616
7	Giant Half Sugar White	44 1,800	1,496 40	31 400	1,040 ..	38 100	1,268 20	9·92	3	1,549
8	Sludstrup B	46 280	1,538 ..	41 240	1,470 40	45 260	1,504 20	8·10	3	1,422
9	Yellow Long Ovoid Mammoth	36	1,200 ..	38	1,266 40	37	1,233 20	10·01	3	1,407
10	Giant Yellow Intermediate	43 1,100	1,451 40	39 200	1,303 20	41 650	1,377 30	8·94	3	1,359
11	Sludstrup A	45 500	1,508 20	41 500	1,375 ..	43 500	1,441 40	8·58	3	1,311
12	Perfection Mammoth Long Red	39 800	1,313 20	35	1,166 40	37 400	1,240 ..	9·44	3	1,023
13	Weibull's Pink	35 1,300	1,188 20	35 1,500	1,191 40	35 1,400	1,190 ..	9·78	3	983
14	Yellow Intermediate	41 930	1,382 10	43 530	1,442 10	42 730	1,412 10	8·15	3	905
15	Giant Yellow Half Long	40 200	1,336 40	37 1,800	1,263 20	39	1,300 ..	8·67	3	763
16	Royal Giant	35 1,800	1,196 40	28 1,400	956 40	32 600	1,076 40	10·35	3	636
17	Weibull's Eckendorffer Red	34 500	1,141 40	34 100	1,135 ..	34 300	1,138 20	9·82	3	678
18	Red Emperor	32 1,000	1,083 20	27 500	908 20	29 1,750	999 10	11·17	3	674
19	Windsor Yellow Globe	44 300	1,471 40	36 400	1,206 40	40 350	1,339 10	8·30	3	669
20	Prize Mammoth Long Red	36 1,600	1,226 40	30 500	1,008 20	33 1,050	1,117 30	9·38	3	289
21	Yellow Short Ovoid Giant	29 1,800	996 40	31 1,200	1,053 20	30 1,500	1,025 ..	10·20	3	273
22	Weibull's Eckendorffer Yellow	42 1,200	1,420 ..	32 1,800	1,096 40	37 1,500	1,258 20	8·14	3	235
23	Elvetham Mammoth	33 900	1,115 ..	29 40	0 973 20	31 670	1,044 10	9·91	3	209
24	Mammoth Long Red	35 1,500	1,19 10	29 1,10	0 985 ..	32 1,300	1,088 20	9·40	3	138
25	Selected Yellow Globe	43 1,600	1,460 ..	34 1,100	1,151 40	39 350	1,305 20	7·82	3	127
26	Giant Half Sugar	36 730	1,212 10	34 930	1,148 50	35 830	1,180 30	8·58	3	77
27	Sludstrup Barres	36 800	1,213 20	30 1,000	1,016 40	33 900	1,115 ..	9·08	3	74
28	Improved Mammoth Saw-Log	38	1,266 40	27 800	913 20	32 1,400	1,090 20	9·13	2	1,971
29	Golden Tankard	40 100	1,335 ..	31 1,000	1,050 ..	35 1,550	1,192 30	8·11	2	1,793
30	Taaroje Barres	34 1,800	1,163 20	32 500	1,075 ..	33 1,150	1,119 10	8·42	2	1,654
31	Giant Yellow Globe	34 1,000	1,150 ..	34 600	1,143 20	34 800	1,146 40	8·21	2	1,648
32	Leviathan	31 500	1,041 40	32 1,600	1,093 20	32 50	1,067 30	8·77	2	1,617
33	Weibull's Excelsior Red	34 1,000	1,150 ..	31 100	1,068 20	33 550	1,109 10	8·17	2	1,437
34	Weibull's Cylinder Barres	36	1,200 ..	30 500	1,008 20	33 250	1,104 10	8·19	2	1,426
35	Red Windsor	39 1,000	1,316 40	33 1,800	1,130 ..	36 1,400	1,223 20	7·32	2	1,373
36	Danish Eckendorffer	34 1,600	1,160 ..	25 800	846 40	30 200	1,003 20	7·86	2	732
	Average	38 1,426	1,290 26	34 889	1,148 ..	36 1,157	1,219 10	.....	3	724

Average Yields.—During the last three years, *i.e.*, since the introduction of the double plot system and the method of calculating the value of the different varieties from the yield, as expressed in tons and bushels, and dry matter content taken together, the results with the variety tests of mangels have been remarkably uniform. From the results gained the following varieties may be especially recommended for the Ottawa district, viz., Giant Yellow Intermediate, Giant Half Sugar White, Gate Post, Danish Sludstrup, and Yellow Leviathan.

Their average yields for the last three years are given in the following table:—

AVERAGE for three years.

Variety.	Yield per acre.				Dry Matte per acre.	
	Tons.	Lb.	Bush.	Lb.	Tons.	Lb.
Giant Yellow Intermediate	31	417	1,040	17	3	719
Giant Half Sugar White	27	1,283	921	23	3	508
Gate Post	26	467	907	47	3	379
Danish Sludstrup	29	880	946	40	3	292
Yellow Leviathan	31	767	1,046	7	3	14

CARROTS.

Ten varieties of carrots were sown on May 20, at the rate of three pounds to the acre. They were thinned the third week of June to about two inches apart in the rows, and harvested on October 4. The crop was not as high as usual. The roots were harvested in good condition and their keeping quality was fair.

In the following table are given the yields of the varieties tested:—

CARROTS.—Test of Varieties.

YIELD PER ACRE.

No.	Variety.	1st Plot.		2nd Plot.		Average.		% Dry Matter.	Matter per acre.	
		Tons.	Lb. Bu. Lb.	Tons.	Lb. Bu. Lb.	Tons.	Lb. Bu. Lb.		Tons.	Lb.
1	Champion	20	800 680 00	19	1,900 665 00	20	350 672 30	10·08	2	67
2	Svalof Champion	21	300 705 00	20	600 676 40	20	1,450 690 50	9·74	2	37
3	Carter's OrangeGiant	19	1,700 661 40	19	1,300 655 00	19	1,500 658 20	9·96	1	1,934
4	Giant White Vosges.	19	100 635 00	17	1,000 583 20	18	550 609 10	10·34	1	1,779
5	Mammoth White Intermediate	20	800 680 00	19	600 643 20	19	1,700 661 40	9·46	1	1,756
6	Ontario Champion	17	250 570 50	16	1,100 551 40	16	1,675 561 15	10·46	1	1,522
7	White Belgian	16	300 538 20	16	250 537 30	16	275 537 55	10·42	1	1,363
8	Improved Short White	15	900 515 00	15	1,000 518 20	15	950 516 40	8·54	1	643
9	Nantes	9	1,400 323 20	10	1,100 351 40	10	250 337 30	11·34	1	296
10	James	10	600 343 20	10	.... 333 20	10	300 338 20	10·31	1	93
	Average	16	1,915 565 15	16	1,085 551 35	16	1,500 558 20	.....	1	1,749

SUGAR BEETS.

Three varieties of sugar beets were tested as usual. They were sown on May 20, at the rate of 8·5 pounds to the acre. They were thinned the third week of June to about six inches apart in the rows and harvested October 4.

The yields of the varieties are recorded in the following table:—

SUGAR BEETS.—Test of Varieties.

No.	Variety.	Yield per Acre.											
		1st Plot.				2nd Plot.				Average.			
		Tons.	Lb.	Bu.	Lb.	Tons.	Lb.	Bu.	Lb.	Tons.	Lb.	Bu.	Lb.
1	Klein Wanzleben	21	1,200	720	..	17	200	570	..	19	700	645	00
2	Improved Vilmorin B	18	1,250	620	50	15	1,000	516	40	17	125	568	45
3	Improved Vilmorin A	19	....	633	20	15	....	500	..	17	....	566	40
	Average	19	1,483	658	03	15	1,733	528	53	17	1,608	593	28

MANGEL SEED GROWING.

With a view to securing data on the possibilities of growing mangels for seed profitably, a total of about 18 tons of mangels were reserved in the fall of 1914. The majority were stored in the root-cellar, a minor part being pitted outside. They all were in good condition for planting in the spring of 1915. About two acres were devoted to seed growing.

YIELDS AND PROFITS.

The land used for the experiment was in roots in 1914. It was fall ploughed and as it had been manured for the previous crop, no manure was applied. It was ploughed again in the spring and was, at the time of planting, in good tilth and a fair state of fertility.

The roots used were of the Mammoth Long Red variety. They were taken from the ordinary farm crop and, as a large number of roots were necessary for the experiment, a great percentage were somewhat inferior for seed raising purposes. In spite of this a good crop of first-class seed was produced, averaging close to 1,150 pounds per acre. With regard to methods of planting, handling of the seed field, harvesting, threshing, etc., the reader is referred to Exhibition Circular No. 58, by F. S. Browne, Assistant to Dominion Agrostologist, entitled "Mangel Seed Growing."

OTTAWA.

In the following table are given details as to cost of production and revenue:—

ONE Acre of Mangel Seed—Cost and Revenue.

Cost —	
Ploughing, spring and fall	$ 4 00
Disc harrowing	1 25
Drag harrowing	0 50
One-third value of manure	8 00
Hauling manure	1 50
Value of roots, 8¾ tons at $3	26 25
Hauling from pit to field	1 00
Planting	14 50
Cultivating, four times	1 20
Hoeing, twice	3 60
Harvesting	7 20
Hauling	1 00
Threshing	3 10
Cleaning seed	3 60
Rent of land	3 00
Total	$79 70
Revenue—	
1,134 pounds of seed f.o.b. Copenhagen at 12 cents per pound	$136 08
Freight to Montreal, 66·8 per cwt.	7 57
Value of roots for feeding	15 00
Total	$158 65
Profit	$78 95

From the table it will be seen that mangel seed growing may be quite a profitable business. The yield of 1,134 pounds of seed per acre realized at the Central Experimental Farm must by no means be considered abnormally high. On the contrary, there are reasons to believe that the yield, under the same conditions, might be increased considerably. In the first place, the roots used for seed raising were not all of first-class quality. As a result the stand was somewhat uneven, with a considerable number of plants producing either seed stalks of inferior type or no seed stalks at all. Furthermore, some loss of seed through shattering was unavoidable, owing to the men engaged in the harvesting of the field being unfamiliar with the operations.

One item in the table showing cost of production and profit may be explained especially, viz., the item in the revenue column reading, "Value of roots for feeding, $15." It is commonly supposed that roots which have produced a seed crop are in such a state at the end of the season that they cannot be used for feeding purposes. The experience gained at Ottawa—and also at other Farms and Stations—shows, however, that a large percentage of the seed producing roots continue to grow throughout the season, and, at the time of harvesting the seed, are of first class quality for feeding.

Factors in influencing the yield.

As mangel seed growing is comparatively very little known in Canada, a few experiments were conducted for the purpose of determining the methods whereby the best yields may be ensured.

1. *Manure and Fertilizers.*—In order to ascertain the value of manure and various fertilizers for seed growing, an experiment was carried out with a number of plots, all in duplicate, as indicated in the following table:—

MANGEL SEED Fertilizer Experiment.

No.	Treatment of Plot.	YIELD PER ACRE.		
		1st Plot.	2nd Plot.	Average.
		Lb.	Lb.	Lb.
1	No manure or fertilizer	750	725	737
2	Stable manure, 20 tons per acre	1,075	1,100	1,087
3	Superphosphate, 500 pounds per acre	800	775	787
4	Nitrate of soda, 200 pounds per acre	875	850	862
5	Muriate of potash, 200 pounds per acre	775	775	775
6	Complete fertilizer (Superphosphate 500 pounds; Nitrate of soda, 200 pounds; Muriate of potash 200 pounds, per acre) —900 pounds.	1,050	1,100	1,075

The land used for the fertilizer experiment had been in grass sod for at least ten years, during which time no manure was applied. It was uniformly poor in character. The results of the experiment most conclusively indicate that much heavier seed crops are obtained when either manure or complete fertilizer is applied. With neither manure nor fertilizer or with incomplete fertilizer, the return is comparatively small.

2. *Early vs. Late Planting.*—Four plots, each 1,200 square feet in size, were planted at different dates, with the following results:—

Plot.	Planted.	Yield per Acre. Lb.
No. 1.	April 26	1,292
" 2.	May 3	1,264
" 3.	" 8	1,081
" 4.	" 14	1,083

The results indicate that early planting is apt to give heavier yields than late. Early planting favours development of big, strong plants having an abundance of flowers at a time of the summer most favourable for setting of the seed. It was also observed that practically all the earliest planted roots produced seed stalks whilst a certain percentage of the roots planted later did not throw out any stalks at all. Practically no difference as to time of maturity of the different plots could be detected.

OTTAWA.

WINTERING SEED ROOTS.

With a view to ascertaining the feasibility and eventual advantage of wintering seed roots in the ground, an experiment was carried out with a number of mangels, swede turnips, and carrots. Four hundred roots each of mangels, turnips, and carrots were dug in the fall and immediately replanted. They were then left for the winter, as follows:—

1. One hundred roots covered with earth;
2. One hundred roots covered with straw;
3. One hundred roots covered with manure;
4. One hundred roots uncovered.

The results of the experiment indicate that the method of wintering mangels in the ground is rather unsatisfactory, no matter whether the roots be left uncovered or whether they be covered as explained above.

In the case of turnips and carrots the case is different. In the experiment, those roots of turnips and carrots which were covered with straw, came through the winter in good condition and started to throw out vigorous seed stalks in the early spring, practically as soon as the frost was out of the ground. Those lots, however, which were covered with earth or manure or which were left uncovered, did not winter satisfactorily at all.

In addition, a number of swede turnips were left in the ground as they grew, in the fall of 1914, without being disturbed and without being in any way covered. These came through the winter satisfactorily, but seemed, in the spring, to be lacking somewhat in vitality.

BREEDING NEW VARIETIES OF FIELD ROOTS.

Many of the varieties of mangels, turnips and carrots grown in Canada at present are, as is well known, far from being perfect with regard to uniformity of type and dry matter content. Even the highest yielding and most esteemed varieties are falling short in those respects and may consequently be improved.

With a view to producing new varieties superior to those now available to the Canadian farmer, the Division of Forage Plants started some breeding work with mangels in 1913 and some work with carrots in 1914. The breeding so far carried out is, however, still to be considered of a preparatory nature.

MANGELS.

The breeding work with mangels is aiming at the production of new varieties capable not only of yielding large crops of roots of highest feeding value, but also of producing large crops of seed of high quality.

With this double object in view, one hundred and twenty-five roots of Giant Yellow Intermediate, which is one of the best mangel varieties available, were set aside in 1914. Only those roots which were perfect with regard to shape, colour and general appearance were selected. They were planted in 1914 for seed production in a place where danger of cross-fertilization with other varieties of mangels or beets was out of the question. The seed plot was closely observed, especially during the early part of the season. All roots which threw up seed stalks of an unsatisfactory character were promptly prevented from producing any seed, the stalks being cut before any flowers were ready for fertilization. About forty pounds of excellent seed was

secured. Part of this will be used for further breeding work and part for experiments at the various branch Farms and Stations.

In order to furnish further material for breeding work, eight crosses were made during the year between sugar beets and mangels. The varieties of mangels used were Giant Half Sugar White, Mammoth Long Red and Giant Yellow Intermediate.

CARROTS.

In 1914, sixty roots of carrots were set aside for breeding work. In the spring of 1915, ten of them were finally selected and planted for seed. Of the number, one plant was isolated and self-fertilized. It produced 10·5 ounces of seed of first-class quality.

LEGUMINOUS FORAGE PLANTS AND GRASSES.

ALFALFA.

Breeding for Hardiness.—In previous reports the great importance of hardiness in alfalfa has repeatedly been emphasized, and in the report for the year 1914-15 the nature of the character called hardiness was discussed at some length.

All results of observations and experiments with alfalfa carried out by the Division indicate that hardiness is an hereditary character, which is transmitted by the seed from one generation to another. This being the case, it stands to reason that hardy alfalfa may be produced by propagation through seed of such individuals as prove themselves able to survive the severest winters.

Working from this basis, the Division has, for a number of years, endeavoured to secure as much seed as possible from plots in the experimental field which have been badly winter-killed. The seed so secured has always proven very satisfactory, the crops raised from it being perfectly hardy, even under the most trying conditions.

In 1914 seed was again secured from the plots referred to, twelve in number. Part of it was used to sow twelve plots, each 1/100 acre in size, in 1915. The plots were seeded early in the spring in drills 8 inches apart at the rate of 12 pounds per acre. The germination was perfect and an exceptionally good growth followed. The plots were cut twice in the season, the height of the crop being about fourteen inches at each cutting. After the second cutting the plots produced a good stand, which was left for winter protection. In the spring of 1916 not the slightest sign of winter-killing could be observed. It may be said, however, that the winter and spring were uncommonly favourable for wintering of alfalfa, and that the plots referred to entered the winter in very good condition.

Breeding for Uniformity.—All breeding work aiming at uniformity and high quality has been started from hardy plants, and as a result the work has been progressing very satisfactorily without having been hampered, in the slightest way, by winter-killing.

In all plant breeding work the way in which the species worked with are being naturally fertilized and the way in which they can be fertilized necessarily determine the breeding methods which should or must be adopted. In order to determine how alfalfa is fertilized naturally and how it can be fertilized artificially, a series of investigations was started in 1912. The work was continued the two following years and a mass of very valuable data collected. In this connection one of the results of the investigations may be mentioned, viz., that alfalfa can easily be self-fertilized and even fertilizes itself automatically in hot and dry weather.

This being the case, it is evident that breeding work leading to uniform varieties may be started from individual plants and may be carried out through the method

generally known as pedigree breeding. This method, by which varieties are developed through self-fertilization has been followed by the Division during the last few years, and has, so far, led to very gratifying results.

From different seed lots obtained by self-fertilization in 1912 some lots of plants were secured in 1913. In 1914 a number of promising individuals were self-fertilized and the seed obtained from seven of these sown in seven separate lots in 1915. The seven "Families" thus secured show a very remarkable uniformity as to colour of flowers, mode of growth, foliage, etc., each family representing an almost perfectly pure variety in the real sense of the word.

In 1913 a number of plants having outstanding characters were self-fertilized. From the seed obtained 17 lots of plants each of thirty individuals were secured. Of these four lots showed a fairly high degree of uniformity with regard to mode of growth, etc., and were for those reasons selected for further breeding work. On account, however, of the wet weather prevailing throughout the season, breeding work was made very difficult. As a result, the work was postponed to a coming year.

RED CLOVER.

Breeding for hardiness in red clover has been based on the same principles as have been governing the breeding for hardy alfalfa. That is, hardiness has been worked for through a process of natural mass-selection by which hardy types have been propagated.

In 1913 nine lots of red clover were sown. The results obtained the following year showed that the degree of hardiness as determined by the percentage of surviving plants, varied greatly in the different lots. They also indicated, what is of great practical importance, that the yielding capacity of a "variety" is very closely associated with its degree of hardiness.

From each of the nine lots mentioned, a quantity of seed was obtained in 1914, sufficient to sow two $\frac{1}{100}$ acre plots. A total of 18 plots were thus sown in 1915. Germination was perfect and a very good stand was obtained in spite of an attack by cutworms. In the spring of 1916, there were no signs of winter-killing in any of the plots, and the prospects for a heavy yield great.

In addition, four plots were sown with seed, gathered from plants which have persisted for five and six years, respectively, and which therefore must be considered decidedly perennial in character. The plots came through the winter without a plant being killed.

SAINFOIN.

Sainfoin, also called Esparsette, has during recent years proven a very valuable forage plant in certain parts of British Columbia, especially the Columbia valley. Observations made on sanfoin fields indicate that this species, like other cultivated plants, is composed of a very great number of different morphological types, of a very different value from an agricultural standpoint.

With a view towards producing, by breeding, pure varieties of higher value than the mixture of varieties available at present, some seed was secured from the Experimental Station, Invermere, B.C., in the fall of 1914. It was sown in pots in the spring of 1915, and from the plants obtained about fifty were transplanted into the experimental field for observation and eventual breeding. All plants came through the winter without injury.

TIMOTHY.

The breeding work with timothy begun in 1912 is progressing satisfactorily, although, owing to the hybrid nature of the plant from which it has been started, progress must necessarily be rather slow.

OTTAWA.

In 1914, seventeen families, each of sixty-five plants, and each secured from a self-fertilized plant, were transplanted in the field. In 1915, the families were closely examined and, as a result, thirteen were discarded, chiefly on account of lack of uniformity. From among the four remaining families, which all displayed a high degree of uniformity of type, a total of eighteen individuals were selected. They were isolated and self-fertilized and produced a quantity of seed of very good quality.

In 1913, commercial seed was sown for the purpose of providing further material for breeding work. A total of about 3,000 plants were secured. In 1914, eighteen plants were selected, isolated and self-fertilized. The seed obtained was sown in pots in the early spring of 1915 and later, sixty-five plants of each of the eighteen families worked with were transplanted into the field to be tested for uniformity and value in general.

ORCHARD GRASS.

Eight families of orchard grass, each having thirty individual plants, were transplanted in 1914 to be tested for uniformity. In 1915 the families showed a remarkably high degree of uniformity, and further work was accordingly planned. However, on account of the weather conditions, the work was postponed to 1916.

WESTERN RYE GRASS.

In 1912 a number of plants of Western rye grass were selected from a field at the Experimental Farm, Indian Head, Sask. The plants were shipped to Ottawa and transplanted. Three of the plants were self-fertilized in 1913. From each of the three seed lots obtained forty plants were secured in 1914. In 1915 the three families showed a surprising uniformity with regard to general appearance within themselves. Nine individuals of outstanding quality were self-fertilized and a quantity of very good seed, to be used for further breeding work in 1916, was secured.

RED TOP.

Of twenty-two seed lots secured in 1914 from open-fertilized plants, fourteen were discarded in 1915. From each of the eight remaining lots fifteen plants were secured which were transplanted in the field 2 feet apart each way for observation and eventual breeding work.

FIELD INVESTIGATIONS.

In co-operation with officers of the Forestry Branch, Dominion Department of the Interior, the Dominion Agrostologist made investigations during part of the summer, in the Crowsnest forest reserve, Alberta, including the Gap, the Livingstone valley and the Porcupine Hills, with a view of determining the cause of cattle poisoning said to occur in the said forest reserve.

The investigations revealed that out of a number of plants which were suspected by cattlemen in the reserve as responsible for the death of cattle through poisoning, only one was really dangerous, viz., Larkspur (*Delphinium Brownii* Rydb). This plant occurs in quantity along practically all the streams and creeks in the Porcupine hills, and is also common in the Gap, at the entrance to the Livingstone valley.

So-called "wild parsnip," which is very common in the Porcupine hills, was suspected by the stockmen to be a poisonous plant of the water-hemlock type. It was found to be a quite harmless plant (*Leptotænia*).

A detailed report on the plants observed in the reserve which are either injurious in any way or directly poisonous, has been submitted to the Director of the Forestry Branch, Department of the Interior, Ottawa.

EXPERIMENTAL STATION, CHARLOTTETOWN, P.E.I.

REPORT OF THE SUPERINTENDENT, J. A. CLARK, B.S.A.

CHARACTER OF SEASON.

The weather conditions during the winter of 1914-15 were unusual. Two cold spells that sent the thermometer to 10° below zero occurred at Christmas and the first of February. Immediately following both of these, mild weather set in that removed all the snow and took all the frost out of the ground. A number of heavy falls of snow in March gave excellent protection to the grass lands. Scarcely any spring heaving of clover was observed. Precipitation in April was light. Large bodies of ice about the province kept the season backward through April and half of May. Vegetation made very slow growth and the trees did not appear green until May 27, or about the same date as in 1914, which was a very late season. Corn and roots were sown the last week in May. June and July were good growing months. Beneficial showers were frequent for dry lands and there was plenty of bright sunshine. A heavy hay crop was well saved, cutting at the Station beginning on the 16th of July, though less than half of the hay was cut in that month. The first three weeks of September were very dry. The roots suffered from the drought and the fall ploughing had to be abandoned. The weather was very seasonable during October and November and the roots were all harvested without injury from frost. The first killing frost occurred on October 2, the date the ensilage corn was cut.

INDIAN CORN.

One-half acre of land was prepared for corn on the side-hill facing west on rotation CC-3, shortly after the middle of May. A dressing of manure at the rate of 20 tons per acre was worked into the land and Longfellow corn was planted, with the potato planter, on June 1. The temperature fell rapidly on the evening of June 8, just after the corn had appeared an inch or so above the ground. The potato planter was used to cover the young plants with three inches of soil; this protected the corn and destroyed the first crops of weeds. The following Monday, when danger from frost was over, the corn was cultivated, which removed most of the clay from over the plants. The above field produced good corn stover, the yield being 12 tons, 1,110 pounds per acre.

The uniform test plots of corn were planted on the cereal rotation "FF" on May 31, and harvested October 2. Thirteen sorts were tested. The seed of all the corn was treated with arsenate of lead before planting. No injury was observed from birds. The yields were computed from one-hundredth acre plots.

INDIAN CORN for Ensilage.—Test of Varieties.

No.	Variety.	Average Height.	Stage of Maturity.	Yield per Acre.	
		Inches.		Tons.	Lb.
1	Longfellow	96	Milk	19	600
2	Golden Glow	111	Early milk	19	500
3	Compton's Early	102	Early milk	18	1,400
4	Salzer's North Dakota	96	Early milk	17	900
5	Wisconsin No. 7	100	Ear just formed	16	1,200
6	King Philip	108	Early milk	16	500
7	Bailey	108	Early milk	15	1,700
8	White Cap Yellow Dent	108	Early milk	15	1,500
9	Quebec Yellow	84	Glazed	15	400
10	Leaming	114	Ear just formed	14	1,800
11	Free Press	78	Late milk	14	100
12	Howie	101	Early milk	13	1,600
13	Canada Yellow	72	Dough	13	900
	Average			16	392

FIELD ROOTS.

The injury from cutworms and the carrot rust-fly was slight during the season of 1915. Poisoned bran was used for the cutworm and preventative measures taken for checking the rust-fly. The white grub, or larvæ of the June bug, did some damage to all of the test plots of turnips by eating off the tap-root of the plants when young. The different sorts of roots were tested on the cereal rotation "FF-3."

TURNIPS.

Seventeen sorts of turnips were sown on June 2, on 1/100 acre plots and pulled November 16. Manure was applied at the rate of 20 tons per acre and worked into the land. The turnips were all sown in drills 30 inches apart. The young plants were thinned to 12 inches apart in the drills.

TURNIPS.—Test of Varieties.

No.	Variety.	Yield per Acre.			
		Tons.	Lb.	Bush.	Lb.
1	Good Luck	33		1,100	..
2	Hazard's Improved	28	500	941	40
3	Best of All	28	....	933	20
4	Perfection	27	1,500	925	..
5	Empress	27	1,500	925	..
6	Magnum Bonum	27	1,000	916	40
7	Bangholm	25	1,500	858	20
8	Corning's Lapland	25	....	833	20
9	Kangaroo	24	1,000	816	40
10	Halewood's Bronze Top	24	1,000	800	..
11	Hartley's Bronze Top	22	1,000	750	..
12	Skirving's	22	1,000	750	..
13	Canadian Gem	21	1,500	725	..
14	New Century	20	1,000	683	20
15	Hall's Westbury	20	1,000	683	20
16	Durham	19	500	641	40
17	Jumbo	18	1,000	616	40
	Average	24	1,059	817	39

MANGELS.

Fourteen varieties of mangels were sown on the cereal rotation "F" on May 6, under similar conditions of tillage to the turnips, in rows 30 inches apart. They were thinned to about ten inches apart in the rows and harvested on October 21. A second sowing was made on rotation A-3 on June 2. The soil conditions were more uniform in this field, which was harvested October 26.

MANGELS.—Test of Varieties.

No.	Variety.	Yield per acre 1st Plot.		Yield per acre 2nd Plot.		Average yield per acre.	
		Tons. Lb.	Bush. Lb.	Tons. Lb.	Bush. Lb.	Tons. Lb.	Bush. Lb.
1	Danish Sludstrup	25 1,000	850 .	25 1,200	853 20	25 1,100	851 40
2	Yellow Leviathan	22 1,000	750 .	26 1,500	891 40	24 1,250	820 ..
3	Perfection Mammoth Long Red	23 1,000	783 20	24 500	808 20	23 1,750	795 ..
4	Giant Yellow Intermediate	23 300	771 40	24 500	808 20	23 1,400	790
5	Giant Yellow Globe	24 1,400	823 20	21 500	708 20	22 1,950	765 ..
6	Prize Mammoth Long Red	24 500	808 20	20 1,300	688 20	22 900	748 20
7	Mammoth Yellow Intermediate	20 1,000	683 20	23 1,200	786 40	22 100	735 ..
8	Selected Yellow Globe	21 1,000	716 40	22	733 20	21 1,500	725
9	Gate Post	20 1,200	686 40	22 1,500	758 20	21 1,350	722 30
10	Giant Half Sugar White	20 1,000	683 20	22 1,000	750 ..	21 1,000	716 40
11	Mammoth Long Red	21 700	711 40	20 1,000	683 20	20 1,850	697 30
12	Leviathan Mammoth	17 1,000	583 20	24	800 ..	20 1,500	691 40
13	Improved Mammoth Saw-Log	17 1,000	583 20	21	700 ..	19 500	641 40
14	Golden Tankard	16 ...	533 20	16 1,000	550 ..	16 500	541 40
	Average	21 721	712 1	22 1,085	751 25	21 1,903	731 43

CARROTS.

Seven varieties of field carrots were sown June 2 and pulled November 17. They were sown in rows 15 inches apart and. owing to the presence of the carrot rust-fly, were not thinned when weeded. They produced much the best crop of carrots yet grown at this Station.

CARROTS.—Test of Varities.

No.	Variety.	Yield per Acre.	
		Tons. Lb.	Bush. Lb.
1	Ontario Champion	36 500	1,208 20
2	Svaloi Champion	34 600	1,143 .0
3	Mammoth White Intermediate	30 700	1,011 40
4	Champion	30 300	1,005 ..
5	Giant White Vosges	27 500	908 20
6	White Belgian	25 700	845 ..
7	Improved Short White	23 ..	766 40
	Average	29 1,043	984 3

CHARLOTTETOWN.

SUGAR BEETS.

Two sorts of sugar beets were sown on June 2, and harvested October 26. They were sown in drills 30 inches apart and thinned to about 8 inches apart in the rows. The field was prepared in the same way as for the turnips.

SUGAR BEETS.—Test of Varieties.

No.	Variety.	Yield per Acre.			
		Ton	Lb.	Bush.	Lb.
1	Klein Wanzleben	13	500	441	40
2	Improved Vilmorin A	11	500	375	..
	Average	12	500	408	20

CLOVER, ALFALFA AND GRASSES.

The clovers and grasses came through the winter in good condition owing to the heavy blanket of snow that fell on the fields in March, and which went off gradually. The late spring retarded growth, but the splendid growing weather of June and July thickened up the bottom of the fields and gave crop yields that were above the average. The following records are taken from the Farm rotations:—

FIELD CROPS OF HAY.

Class of Hay.	Field.	Preceding Crop.	Acreage.	Yield per acre	
				Tons.	Lb.
Clover Hay	G—1	Oats	0·4	3	1,100
Mixed Hay	C—1	Clover	0·57	3	1,020
Clover Hay	A—5	Oats	1·0	3	100
Clover Hay	C—4	Oats	0·57	2	1,950
Mixed Hay	A—1	Clover	1·0	2	1,800
Mixed Hay	G—2	Clover	0·4	2	1,380
Mixed Hay	FF—1	Oats	2·0	2	670
Clover Hay	B—5	Wheat	1·0	2	470
Timothy Hay	G—4	Timothy	0·4	2	450
Timothy Hay	G—3	Timothy	0·4	2	430
Clover Hay	F—4	Wheat	0·86	1	1,670
Timothy Hay	CC—1	Timothy	4·5	1	1,640
Clover Hay	D—3	Wheat	1·0	1	780
Mixed Hay	B—2	Oats	1·0	..	1,590
		Average	.....	2	789

EXPERIMENT WITH GRASSES, CLOVERS AND ALFALFA.

The series of experimental plots of grasses and alfalfa sown in 1912 have produced crops in 1913, 1914, and again in 1915. The series started in 1913 was broken up owing to the draining of the land where they were sown. Another series was set out in 1914.

CHARLOTTETOWN.

This land was taken in connection with the fertilizer experiment started in 1915 in co-operation with the Division of Chemistry. A further series was sown in 1915 in duplicate in what is hoped may be a permanent location for these experiments. They made splendid growth in 1915 and were cut back in August.

The following data were secured from the plots sown in 1912:—

Among the grass plots Kentucky Blue grass led, with a yield at the rate of 1 ton 1,660 pounds per acre. Red Top was next, with 1 ton 940 pounds per acre; then English Rye grass, with 1,980 pounds, and timothy with 1,860 pounds per acre.

The clovers sown in 1912 had all disappeared. Grimm's alfalfa has stood the weather conditions best. The three strains sown in 1913 gave the following returns from one cutting:—

Variety.	Plot.	Yield per acre.	
		Tons.	Lb.
Grimm, (1912 seed)	A	2	590
Grimm, (1911 seed)	B	2	300
Grimm, (Ewing seed)	C	2	90
Average	.....	2	327

After the first cutting they were left, in the hope that they might produce seed. This hope, however, did not materialize. It has been found that the natural grasses are the greatest enemies of alfalfa, as they choke many of the plants out after a time.

DATES OF CUTTING CLOVER AND TIMOTHY.

An area was staked off in a field of timothy and another in a field of clover and then sub-divided and cut each week to determine the best date for cutting. The areas were as uniform as could be obtained. The first cutting of timothy was made on July 16, when the hay was green. It was saved in good condition in four days and gave the greatest weight of good hay. The hay came in bloom a week later. At this time the least return was obtained. On August 4 the hay was in the condition when it is generally cut in this province. It was saved on the 6th. The returns were not so large as from the first cutting. On August 12 the last cutting was ripe and woody and saved next day. It gave a heavier return than that cut the middle of July.

The first cutting of clover was made on July 12, when in full bloom. It was saved in excellent condition in four days. The cutting made July 19, when one-half of the heads were brown, was saved on the 23rd. It gave about the same yield, but was not so well cured. Eighty per cent of the heads were brown and some were ripe when cut on the 26th. This cutting gave the heaviest yield, though many leaves fell off and were lost. On August 3 stems were getting woody, and when cut the bloom was gone. It was saved in good condition the next day, but gave the lightest yield of any. Further cuttings were made on August 12 and 16. Many of the leaves were dead and brown. This hay was made in one day. Samples from all of these cuttings of timothy and clover were sent to the Dominion Chemist for analysis.

CHARLOTTETOWN.

EXPERIMENTAL FARM, NAPPAN, N.S.

REPORT OF THE SUPERINTENDENT, W. W. BAIRD, B.S.A.

WEATHER CONDITIONS AND CROP NOTES.

Spring opened up very late. Wet, cold weather was experienced well on to the last of May. Rain was recorded on ten different days in April and on sixteen in May, falling in that period 7·72 inches. The mean temperature for May was 4·31° lower than for the same period for the previous year.

During the first two weeks in June the days were fine and warm, but the nights were cool, 2° of frost being recorded on the night of the 3rd. Therefore, the soil did not warm up readily. The latter part of the month was very unsettled, wet, muggy weather prevailing.

July was a good growing month. The weather was fine and warm and six showers that were recorded supplied sufficient moisture to stimulate the growth of all vegetation. Owing to the bad weather conditions early in the season, roots were not seeded until July 3, and part much later, the land not being workable.

August was quite unseasonable. Much rainy weather was experienced during the early and latter parts. The total precipitation was 4·67 inches; yet the mean temperature was 2° higher than for the same period the previous year. Roots made only fair growth, greatly due to so much wet weather; consequently abundance of weeds and insufficient cultivation. All cereals made good growth, but the weather was most unsatisfactory for hay-making.

September was rather cool throughout. The first two weeks were very fine, with much fog in the early mornings.

October was unsettled. The thermometer dropped to 24° on the 2nd. From the 3rd to 9th the weather was dull and rainy. The remainder of the month was fairly fine and cool with frequent light showers.

November was very unfavourable throughout. Six inches of snow fell on the 6th, but was removed by a heavy rain on the 7th. Quite heavy frosts were not uncommon during the latter part. On the night of the 23rd 13° was registered. This made it very difficult in the harvesting of roots.

December for the most part was quite typical of winter. Four inches of snow fell on the 1st. From the 2nd to 7th was very mild. Some ploughing was done during this period. From the 7th to 9th alternate rain and snow fell. Snow was recorded again on the 18th, 24th and 26th. The remainder of the month was very fine and cold.

Typical winter weather was not experienced during January, as the snowfalls and heavy frosts were always followed by a very moderate or warm period. Therefore, little sledding was obtained during the month. For the greater part of February and March splendid winter weather prevailed, which greatly facilitated lumbering operations.

Some Weather Observations taken at Nappan Experimental Farm, 1915.

Month.	Temperature F.			Precipitation.			Total Sunshine.
	Highest.	Lowest.	Mean.	Rainfall.	Snowfall.	Total.	
	°	°	°	Inches.	Inches.	Inches.	Hours.
January	53	−10	21·61	2·69	14·00	4·09	75·10
February	54	−14	23·04	1·01	3·00	1·31	94·70
March	48	9	26·35	....	12·00	1·20	75·00
April	62	18	35·50	2·19	11·00	3·29	100·90
May	71	26	45·72	4·43	....	4·43	136·15
June	81	30	56 44	3·57	....	3·57	195 60
July	81	43	62·93	1·95	....	1·95	215·10
August	81	34	63·04	4·67	....	4·67	186·60
September	78	32	56·49	1·47	....	1·47	175·70
October	68	24	48·11	4·11	....	4·11	145·90
November	57	19	38·46	4·63	....	4·63	47·90
December	52	6	28·59	3·96	8·00	4·76	61·40
Total for year				34·68	48·00	39·48	1512·15
Average for 5 years				30·79	54·34	36·73	1884·67
Total for 6 growing months, Apr. to Sept				18½28	11·00	19·38	1909·15
Average for 5 years for 6 growing months, April to September				17·74	8·50	18·59	1228 34

INDIAN CORN.

Indian Corn for Ensilage.—Test of Varieties.

No	Variety.	Average Height.	Stage of Maturity.	Yield per Acre.					
				1st Plot.		2nd Plot.		Average.	
		Inches.		Tons.	Lb.	Tons.	Lb.	Tons.	Lb.
1	Golden Glow	78	Watery	13	1,000	11	1,300	12	1,150
2	Wisconsin No. 7	98	Soft Glaze	12	1,000	11	300	11	1,650
3	King Philip	84	Watery	9	1,500	11	1,500	10	1,500
4	Salzer's North Dakota	84	Watery	10	700	9	700	9	1,700
5	Howie	74	Watery	10	300	9	700	9	1,500
6	White Cap Yellow Dent	96	Soft Glaze	10	500	9	400	9	1,450
7	Longfellow	76	Watery	9	700	9	....	9	350
8	Quebec Yellow	80	Soft Glaze	9	1,300	8	700	9	....
9	Compton's Early	78	Soft Glaze	6	400	10	1,500	8	950
10	Bailey	72	Watery	6	....	10	1,000	8	500
11	Leaming	84	Watery	8	1,600	7	700	8	150
12	Free Press	65	Glazed	7	1,000	5	500	6	750
13	Canada Yellow	60	Glazed	4	700	5	....	4	1,350
			Average	9	208	9	254	9	231

Thirteen varieties were sown in uniform test plots in duplicate sets of one-hundredth of an acre. The land was clay loam, top-dressed in the fall at the rate of 20 tons of barnyard manure per acre and ploughed under to a depth of 5 inches in the spring of 1915. One-half of the field was rolled as soon as it was dry. It was then gone over by the spring-tooth once, double cutaway twice, and smoothing harrow once.

Nappan.

The seed was sown on June 15 with a Planet Jr. hand drill. The flots were sown on that portion of the field which had been rolled, as it worked up much better than did the other half on which the field lots were sown. The land was harrowed once with a smoothing harrow just as the young shoots were showing above the ground. It also received two hoeings and four cultivations with the horse cultivator. The corn was cut October 25.

The preceding table gives the comparative results.

Six varieties of corn, which were procured from the Agricultural School at Woodstock, N.B., were sown in test plots of an acre. One set was planted in hills 42 inches apart each way, with six kernels to the hill, and afterwards thinned to four stalks. Another set of plots was sown in rows 42 inches apart, two kernels being dropped every 10 inches and the stand thinned to one stalk every 10 inches. The corn was sown June 15 and the crop cut October 25.

The following table gives the comparative results:—

INDIAN CORN for Ensilage.—Test of Varieties.

No.	Variety.	Average Height.	Stage of Maturity.	YIELD PER ACRE.					
				1st Plot.		2nd Plot.		Average.	
		Inches.		Tons.	Lb.	Tons.	Lb.	Tons.	Lb.
1	Golden Glow	86	Soft Glazed	10	500	9	500	9	1,500
2	Compton's Early	80	Soft Glaze	6	1,500	10	1,500	8	1,500
3	Longfellow	76	Watery	8	300	9	300	8	1,300
4	Quebec Yellow	80	Soft Glazed	6	1,000	6	700	6	850
5	N.B. Yellow	60	Glazed	6	1,300	5	1,500	6	400
6	Quebec Yellow No. 28	62	Glazed	5	1,300	5	1,700	5	1,500
			Average	7	650	7	1,700	7	1,175

AVERAGES FOR FIVE, FOUR, THREE AND TWO YEARS.

Of the varieties now being tested only one has been grown for five years, one for four years, two for three years, six for two years, and three only one year.

	Name of Variety.	No. of years in test.	Average date of sowing.	Average date of cutting.	Yield per acre	
					Tons.	Lb.
1.	Early Longfellow	5	June 6	Oct. 4	13	1,026
2.	Compton's Early	4	" 2	" 2	11	1,525
3.	Salzer's North Dakota	3	" 3	" 5	13	333
4.	Canada Yellow	3	" 3	" 5	9	1,750
5.	Free Press	2	" 7	" 13	6	1,875
6.	Golden Glow	2	" 7	" 13	13	1,625
7.	King Philip	2	" 7	" 13	13	750
8.	Wisconsin No. 7	2	" 7	" 13	14	1,875
9.	White Cap Yellow Dent	2	" 7	" 13	11	725
10.	Bailey	2	" 7	" 13	10	725

The average results for Longfellow were taken from 1910 to 1915, inclusive: yields for 1912 were not on record. The heaviest yield was recorded in 1914, viz., 15 tons 1,500 pounds. The earliest date of seeding was May 28 in 1913, and the latest date of harvesting was October 24 in 1915.

For Compton's Early results from 1910 to 1915, inclusive, were taken: 1912 and 1914 were not on record. The heaviest yield was in 1913, viz., 14 tons 500 pounds. The earliest date of seeding was May 28 in 1913; latest date of harvest October 24 in 1915.

For Salzer's North Dakota results from 1913-15, inclusive, were taken. The heaviest yield was in 1914, 16 tons 750 pounds. The earliest date of seeding was May 28 in 1913 and latest date of cutting was October 24, 1915.

For the remainder the dates were all alike, taken from 1914 and 1915 results. Earliest date of seeding was May 20 in 1914 and the latest date of cutting was October 24 in 1915.

From the above tables it is interesting to note that while Longfellow has not been the heaviest yielder yet its average for five years is sufficient to warrant it being recommended as one of the best yet for this district.

FIELD CROP OF INDIAN CORN.

Four and a half acres of Longfellow corn were sown for ensilage purposes. Seed was sown by a seed drill on June 15, and harvested on October 16.

The following yield was obtained:—

Name of Variety.	No. of Acres.	Total Yield.		Yield per acre.	
		Tons.	Lb.	Tons.	Lb.
Longfellow	4½	49	....	10	1,778

It is of interest to know that one section of the field which was rolled soon after ploughing worked up more easily and gave a better seed-bed than did the other section not rolled.

Furthermore, germination took place much more rapidly and the crop maintained a slightly stronger growth throughout the season.

TURNIPS.

Seventeen varieties of turnips were sown on July 3 in uniform test plots in duplicate sets of one-hundredth of an acre each. The two plots of each variety were not sown side by side, but on different parts of the experimental field.

The land was clay loam; it was not underdrained, but natural drainage was very good. It was ploughed to a depth of 5 inches in the fall of 1914. In the spring of 1915 it was cutaway harrowed once, then manured at the rate of 15 tons per acre, cross-ploughed, harrowed twice, once with double cutaway and once with smoothing harrow. It was then drilled and the seed sown with a Planet jr. hand drill at the rate of 3 pounds per acre. The turnips were hoed twice, thinned out to about 12 inches apart and cultivated four times during the season. The crop was pulled October 27.

NAPPAN.

The following table gives the comparative results:—

TURNIPS.—Test of Varieties.

No.	Variety.	1st Plot Yield per Acre.		2nd Plot Yield per acre.		Average Yield per Acre.	
		Tons. Lb.	Bush. Lb.	Tons. Lb.	Bush. Lb.	Tons. Lb.	Bush. Lb.
1	Bangholm	15 1,200	520 00	13 1,600	460 00	14 1,400	490 00
2	Perfection	14 1,200	486 40	13 1,500	458 20	14 350	472 30
3	Empress	15 400	506 40	12 1,500	425 00	13 1,950	465 50
4	New Century	14 900	481 40	13 500	441 40	13 1,700	461 40
5	Hall's Westbury	14 1,700	495 00	12	400 00	13 850	447 30
6	Hartley's Bronze Top	14 1,100	485 00	12 100	401 40	13 600	443 20
7	Halewood's Bronze Top	14 800	480 00	12 200	403 20	13 500	441 40
8	Durham	12 800	413 20	13 1,800	463 20	13 300	438 20
9	Hazard's Improved	14 1,300	488 20	11 1,100	385 00	13 200	436 40
10	Canadian Gem	13 1,300	455 00	11 1,800	396 40	12 1,550	425 50
11	Good Luck	15 500	508 20	10 200	336 40	12 1,350	422 30
12	Magnum Bonum	14 1,300	488 20	10 300	338 20	12 800	413 20
13	Best of All	13 500	441 40	10 700	345 00	11 1,600	393 20
14	Jumbo	13 400	440 00	10 200	336 40	11 1,300	388 20
15	Kangaroo	13 100	435 00	10 400	340 00	11 1,250	387 30
16	Skirving's	12 1,200	420 00	10 1,000	350 00	11 1,100	385 00
17	Corning's Lapland	11 1,200	386 40	10 700	345 00	10 1,950	365 50
	Average	13 1,994	466 34	11 1,388	389 48	12 1,691	428 11

It will be noted that four new varieties have been added to the tests since last year, namely, Skirvings, Empress, Durham, and Best of All. It will also be noted from the above table that the yields are very low. This was due to such a poor season for all kinds of roots. The spring was backward and much rainy weather was experienced throughout. Therefore, cultivation was not effective, with but few exceptions. This was true throughout this district.

AVERAGES FOR FIVE, THREE AND TWO YEARS.

Of the seventeen varieties of turnips now being tested nine have been grown for five consecutive years, three for three years, one for two years, and four for one year only.

Name of Variety.	No. of years Tested.	Average date of Sowing.	Average date of Pulling.	Average Yield per Acre.
				Bush. Lb.
1. Mammoth Clyde	5	June 7	Oct. 24	1,010 3
2. Perfection	5	" 7	" 24	954 44
3. Magnum Bonum	5	" 7	" 24	954 28
4. Good Luck	5	" 7	" 24	951 59
5. Jumbo	5	" 7	" 24	947 58
6. Hartley's Bronze Top	5	" 7	" 24	936 18
7. Hall's Westbury	5	" 7	" 24	933 54
8. Halewood's Bronze Top	5	" 7	" 24	933 20
9. New Century	3	" 7	" 24	862 7
10. Bangholm	5	" 7	" 24	842 45
11. Hazard's Improved	3	" 7	" 24	803 38
12. Corning's Lapland	3	" 7	" 24	791 4
13. Canadian Gem	2	" 7	" ..	656 26

The five-year results are computed from 1911 to 1915, inclusive. The poorest yields were obtained in 1915 and the best in 1913. The highest yield during the five years was obtained from Good Luck in 1913, 1,412 bushels and 30 pounds. From the above table it will be noted that Mammoth Clyde has given the highest average for five years with Perfection, Magnum Bonum and Good Luck following very close. The earliest date of seeding was May 21 in 1913, and the latest July 3 in 1915. Hence from these results it may be stated that the best and surest results are most likely to be obtained by early seeding of turnips. It likewise enables earlier storage in better conditions, which, from a keeping standpoint, is very important. When feeding value per acre is sought after the turnip crop may be considered one of the most valuable for this district to be grown where live stock is kept to any extent.

MANGELS.

Fourteen varieties of mangels were sown on July 3 in uniform test plots in duplicate sets of one-hundredth of an acre each. The land was clay loam and received the same treatment as that allowed to turnips; also the same cultivation.

All seed was sown on July 3 at the rate of 6 pounds per acre. The rows were 28 inches apart and the plants thinned to 12 inches apart in the rows. The crop was pulled October 26.

The following table gives the comparative results:—

MANGELS.—Test of Varieties.

No.	Variety.	1st Plot Yield per Acre.				2nd Plot Yield per Acre.				Average Yield per Acre.			
		Tons.	Lb.	Bush.	Lb.	Tons.	Lb.	Bush.	Lb.	Tons.	Lb.	Bush.	Lb.
1	Giant Yellow Globe	10	1,300	355	20	10	1,100	351	40	10	1,200	353	20
2	Yellow Leviathan	10	1,200	353	20	10	800	346	40	10	1,000	350	00
3	Improved Mammoth Saw-Log	9	500	308	20	9	900	315	.	9	700	311	40
4	Mammoth Long Red	9	400	306	40	9	600	310	..	9	500	308	20
5	Select Yellow Globe	9	....	300	.	8	500	275	.	8	1,250	287	30
6	Giant Half Sugar White	7	1,300	255	..	7	700	245	.	7	1,000	250	.
7	Gate Post	7	800	246	40	7	200	236	40	7	500	241	40
8	Elvethan Mammoth	7	600	243	20	7	300	238	20	7	450	240	50
9	Giant Yellow Intermediate	6	1,200	220	..	6	900	215	.	6	1,050	217	30
10	Danish Sludstrup	7	....	233	20	6	..	200	..	6	1,000	216	40
11	Mammoth Yellow Intermediate	6	1,000	216	40	6	500	208	20	6	750	212	30
12	Perfection Mammoth Long Red	6	700	211	40	6	650	210	50	6	675	211	15
13	Golden Tankard	6	500	208	20	6	....	200	.	6	250	204	10
14	Prize Mammoth Long Red	6	....	200	..	5	900	181	40	5	1,450	190	50
	Average	7	1,679	261	19	7	1,146	252	26	7	1,413	256	53

AVERAGE for Five and Three Years.

Of the fourteen varieties now being tested only seven have grown for five consecutive years, four for three years and three new ones were added to the list last year. The following table gives the average yield for five and three years:—

Variety.	No. of Years in Test.	Average Date of Seeding.	Average Date of Cutting.	Average Yield per Acre.	
				Bush.	Lb.
1. Selected Yellow Globe	5	June 2	Oct. 17	804	57
2. Giant Yellow Intermediate	5	" 2	" 17	778	36
3. Giant Yellow Globe	5	" 2	" 17	751	42
4. Mammoth Long Red	5	" 2	" 17	614	50
5. Gate Post	5	" 2	" 17	658	11
6. Prize Mammoth Long Red	5	" 2	" 17	593	9
7. Perfection Long Red	5	" 2	" 17	588	19
8. Yellow Leviathan	3	" 2	" 17	648	50
9. Giant Half Sugar White	3	" 2	" 17	581	33
10. Danish Sludstrup	3	" 2	" 17	535	53
11. Golden Tankard	3	" 2	" 17	455	30

The above results are computed from the records of 1911 to 1915, inclusive, except in the case of Selected Yellow Globe, where 1910 results were taken, as 1912 results were not on record.

From the above table it will be noted that Selected Yellow Globe gave the highest average, 804 bushels 57 pounds, with Giant Yellow Intermediate and Giant Yellow Globe very close, second and third, respectively. The highest yield during the 5 years was obtained from Selected Yellow Globe in 1911, viz., 1,433 bushels 20 pounds. The earliest date of seeding was May 21, in 1913, and the latest July 3, 1915. Mangels are a valuable crop to grow for dairy feed when they do well, but from results obtained at this Farm it cannot be said that they are nearly as sure a crop as turnips, taking one year with another.

CARROTS.

Six varieties of carrots were tested in uniform test plots in duplicate sets of one-hundredth of an acre each. The land was clay loam prepared in the same way as that allotted to turnips and mangels. The seed was sown on July 3 with a Planet jr. hand drill. The carrots were hoed and thinned twice, leaving them about four to five inches apart in the rows, which were 28 inches apart. The horse cultivator was run through them four times during the season, but owing to so much wet weather it was not as effective as it would have been, had conditions been more suitable. The crop was pulled October 28.

The following table gives the comparative results:—

CARROTS.—Test of Varieties.

No.	Variety.	1st Plot Yield per Acre.				2nd Plot Yield per Acre.				Average Yield per Acre.			
		Tons.	Lb.	Bush.	Lb.	Tons.	Lb.	Bush.	Lb.	Tons.	Lb.	Bush.	Lb.
1	White Belgian	7	500	241	40	3	700	111	40	5	600	176	40
2	Ontario Champion	5	500	175	..	3	1,100	118	20	4	800	146	40
3	Improved Short White	5	200	170	..	3	500	108	20	4	350	139	10
4	Svalof Champion	4	1,000	150	..	3	700	111	40	3	1,850	130	50
5	Mammoth White Intermediate	4	1,000	150	..	3	300	105	.	3	1,650	127	30
6	Giant White Vosges	4	500	141	40	3	500	108	20	3	1,509	125	..
	Average	5	283	171	23	3	633	110	33	4	458	140	58

AVERAGE FOR FIVE AND THREE YEARS.

Of the six varieties of carrots now being tested at this Farm five have been grown continuously for five years and one for three years. The following table gives the comparative results:—

Variety.	No. of Years in Test.	Average Date of Seeding.	Average Date of Pulling.	Average Yield per Acre.
				Bush. Lb.
1. Improved Short White	5	June 5	Oct. 22	517 38
2. Half Long Chantenay	5	" 5	" 22	546 45
3. Mammoth White Intermediate	5	" 5	" 22	480 8
4. White Belgian	5	" 5	" 22	468 55
5. Ontario Champion	5	" 5	" 22	464 43
6. Giant White Vosges	3	" 5	" 22	424 4

The above results were computed from records of 1911 to 1915, inclusive, with the two exceptions. In the case of the Giant White Vosges it was taken from 1913 to 1915, and for Half Long Sugar White from 1910 to 1914, inclusive. Of the five varieties tested for five years the latter gave the highest yield, viz., 546 bushels and 45 pounds. Improved Short White and Mammoth White Intermediate came second and third, yielding 517 bushels 38 pounds and 480 bushels 8 pounds, respectively.

The above results are sufficient to warrant more carrots being grown, especially as they are an excellent tonic for horses in the fall.

SUGAR BEETS.

Three varieties of sugar beets were sown on July 3 in uniform test plots in duplicate sets of one-hundredth of an acre each. The soil was clay loam, receiving the same method of treatment as that allotted to turnips. The sugar beets were hoed twice and thinned to 12 inches apart in the rows, which were 28 inches apart. They were also cultivated four times with a one-horse cultivator, but owing to the exceptionally poor season for roots the yield was very little over half the usual. The crop was harvested October 26.

The following table gives the comparative yields:—

SUGAR BEETS.—Test of Varieties.

No.	Variety.	1st Plot Yield per Acre.		2nd Plot Yield per Acre.		Average Yield per Acre.	
		Tons. Lb.	Bush. Lb.	Tons. Lb.	Bush. Lb.	Tons. Lb.	Bush. Lb.
1.	Vilmorin Improved A	6 1,200	220 ..	6 100	201 40	6 650	210 50
2.	Vilmorin Improved B	6 700	211 40	5 1,200	186 40	5 1,950	199 10
3.	KleinWanzleben	6 500	208 20	5 700	178 20	5 1,600	193 20
	Average	6 800	213 20	5 1,333	188 53	6 67	201 7

AVERAGE FOR FIVE, FOUR AND THREE YEARS.

Of the three varieties now being tested one only has been grown for five consecutive years and two for three. The fourth that is recorded in this table, namely, "French Very Rich," was not grown in 1915, but the results of the four previous years are here given. The following table gives the average and comparative results:—

Number.	Variety.	No. of Years in Test.	Average Date of Seeding.	Average Date of Cutting.	Average Yield per acre.	
					Bush.	Lb.
1	Klein Wanzleben	5	June 3	Oct. 18	364	57
2	French Very Rich	4	" 17	" 12	416	8
3	Vilmorin Improved A	3	" 17	" 12	335	18
4	Vilmorin Improved B	3	" 17	" 12	318	17

From the above table it will be noted that French Very Rich gave the highest yield, 416 bushels 8 pounds, while Vilmorin B gave the lowest, 318 bushels 17 pounds. As the average is not taken from the same number of years in each case the results are not as comparable as they otherwise might have been. It is also to be noted that the yields of all four varieties are very fair, remembering that the yields for 1915 were very poor for all root crops, owing to unfavourable weather conditions during the growing season.

It may also be interesting to note the results of the chemist's test of sugar-beets grown at this Farm. The results of 1914, also from 1902 to 1914, will be found in the 1915 report, volume 1, pages 156, 157, and 159. It will be seen that the percentage of sugar in the beets grown at this Farm compares very favourably with those obtained elsewhere in Canada. In the thirteen years of investigation the percentage has only three times dropped below 16 per cent. The highest was recorded in 1913, viz., 19·17 per cent.

ALFALFA, CLOVERS AND GRASSES.

Alfalfa.—The alfalfa which was sown during the season of 1914 and which had made an excellent growth that fall did not come through the winter of 1914-15 at all satisfactorily. Not more than 40 per cent of the plants showed a healthy growth the second season. Consequently, it was decided to plough up the field, to give it a top dressing of manure at the rate of 20 tons per acre, to work it up thoroughly to a good depth and have the land in an excellent shape for the 1916 season.

However, six plots of one-fortieth of an acre each were sown right alongside of the above field of alfalfa. Two plots were sown to Grimm (Alberta-grown seed), two to Liscomb (Minnesota-grown seed), and two with seed from the Central Experimental Farm. One plot of each of the varieties received ground limestone at the rate of 3,000 pounds per acre. Seed was sown at the rate of 25 pounds per acre on July 15. The land was clay loam in a fair state of fertility, well underdrained. As the seeding was done very late and the season was so wet the growth was very slow, but the results were very much in favour of the plots receiving ground limestone. There were not only more plants per square foot, but they were taller and of a more healthy appearance. Though this is only one year's trial with ground limestone, yet, it would appear that it is beneficial in the production of alfalfa when applied to the soil.

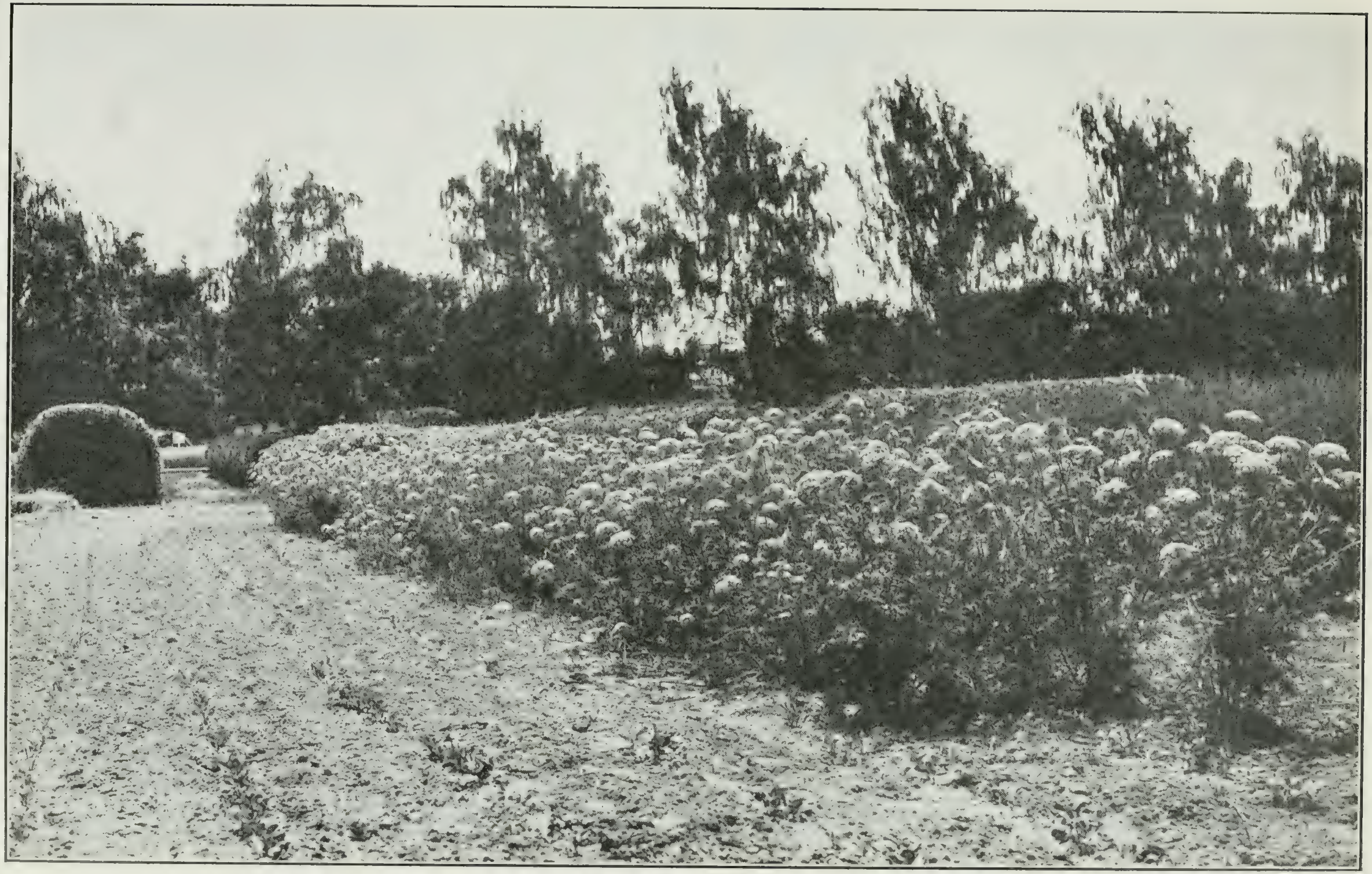
Grasses and Clovers.—Unfortunately the season of 1915 was not a very satisfactory one for the production of either grass or clover seed. However, the plots which were grown for hay production did fairly well.

The following table gives the comparative results:—

Hay.	Yield per Acre.	
	Tons.	Lb.
1. Clover	5	1,900
2. Clover	6	325
3. Clover	5	1,475
4. Clover	5	1,305
5. Clover	5	1,645
Average	5	1,730
1. Timothy	5	1,050
2. Timothy	4	500
3. Timothy	4	755
4. Timothy	4	75
5. Timothy	4	670
Average	4	1,010

NAPPAN.

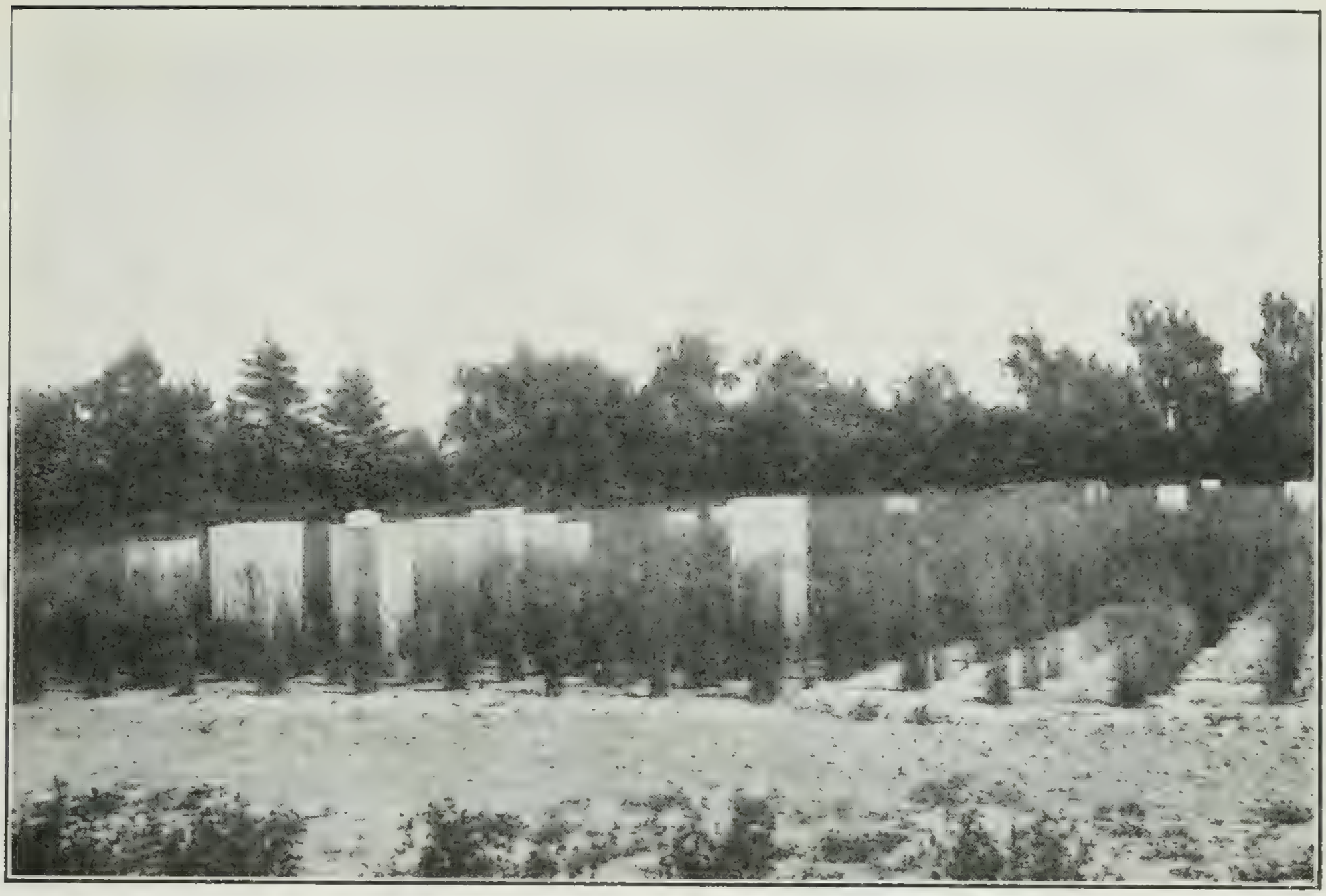
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C. F. F., Ottawa. Carrot Seed Crop in Bloom.



C. E. F., Ottawa. Harvesting Mangel Seed.



General view of Timothy Breeding Block. Central Experimental Farm, Ottawa.



Alfalfa Breeding: Two distinct varieties obtained by repeated self-fertilization, at the Central Experimental Farm, Ottawa.



Harvesting Root Crop at the Experimental Farm, Brandon, Man.

EXPERIMENTAL STATION, KENTVILLE, N.S.

REPORT OF THE SUPERINTENDENT, W. SAXBY BLAIR.

CHARACTER OF SEASON.

The season was not a favourable one for root crops except on naturally dry soils. The turnip crop, which is the principal root crop grown in this section, is, for the most part, grown on the heavier soils, and these soils remained so wet that they could not be properly worked for the crop. The putting in of this crop was delayed, and as a result the plants did not get well established before the warm weather approached. Even the lighter soils, which were worked under unfavourable conditions, seemed to lack life during the season and the crop never seemed to make proper growth.

It will be noticed from the table following that the rainfall during the six growing months was not as great as during the two previous years. The total hours of sunshine for these months was also less, but the temperature compared favourably with other years.

The rains were fairly well distributed, and although not heavy at any time, were very continuous, with the result that at no period during the season did crops suffer for want of moisture; in fact, in many cases the crops suffered from too much moisture. The reason for the excessive dampness on some soils during practically the whole season can be accounted for largely by the continuous dark weather with occasional showers, and the almost total absence during the summer of prolonged drying winds.

The season was particularly favourable for grass and clover, but the dark and damp weather during the latter part of July and August made the work of curing these crops very difficult.

The season on the whole was a good one for corn. The month of September being without any frost to the 26th, was favourable, and as a result a fairly well matured crop was harvested.

The meteorological records for this, as compared with the two preceding years, is given in the following table:—

Month.	Mean Average Temperature.			Rainfall.			Sunshine.		
	1913	1914	1915	1913	1914	1915	1913	1914	1915
	°	°	°	In.	In.	In.	Hr.	Hr.	Hr.
April	41·9	36·8	39·36	4·29	2·33	1·70	137·1	196·0	107·4
May	46·2	50·72	46·14	3·17	1·46	2·50	178·2	189·6	160·9
June	56·7	56·2	56·8	1·23	4·20	2·43	270·1	250·3	180·2
July	65·4	62·88	64·0	3·72	1·45	1·52	252·1	238·9	215·7
August	63·3	63·0	63·8	1·70	2·58	3·84	238·4	211·1	168·8
September	54·3	57·6	57·25	2·55	3·65	·85	156·6	173·8	194·0
Total	.....	.....	.....	16·66	15·67	12·84	1232·5	1259·7	1026·5

INDIAN CORN.

Fourteen varieties of corn for ensilage were tested in duplicate plots of one one hundred and tenth acre each. The seed was sown May 24. The crop was harvested October 1.

The land was a light sandy loam, which had been in potatoes the previous season. It was manured in the spring with stable manure at the rate of 15 tons per acre, which was spread broadcast and ploughed under. Ground limestone was then applied at the rate of 1 ton per acre and the ground well cultivated with the disc harrow. Acid phosphate at the rate of 500 pounds per acre was then applied and harrowed in. The ground was levelled with the levelling harrow and the seed planted with the hand planter in rows 3 feet apart, spaced to 6 inches apart in the row, and one plant was allowed to grow in a place.

INDIAN CORN for Ensilage.—Test of Varieties.

No.	Variety.	Average Height.	Stage of Maturity.	Yield per Acre.		
				1st Plot.	2nd Plot.	Average.
				Tons. Lb.	Tons. Lb.	Tons. Lb.
1	Eureka	86	Silking	15 140	19 60	17 100
2	Bailey	72	Dough	13 1,280	15 1,570	14 1,425
3	Leaming	84	Milk	16 450	12 1,850	14 1,150
4	Longfellow	78	Dough	14 930	14 1,040	14 985
5	Wisconsin No. 7	72	Milk	13 1,830	14 1,040	14 435
6	King Philip	84	Dough	13 1,170	11 550	12 860
7	White Cap Yellow Dent	78	Dough	14 490	10 680	12 585
8	Howie	72	Milk	13 1,060	10 1,670	12 365
9	Compton's Early	78	Dough	12 200	11 1,870	12 35
10	Golden Glow	66	Dough	10 20	11 330	10 1,173
11	Salzer's North Dakota	72	Dough	19 790	8 1,600	9 1,195
12	Quebec Yellow	48	Glazed	7 190	7 630	7 410
13	Free Press	48	Glazed	5 890	5 1,220	5 1,055
14	Canada Yellow	43	Glazed	2 290	2 1,280	2 785
	Average			11 1,124	11 385	11 754

FIELD ROOTS.

The ground on which the variety tests of field roots were conducted was previously in beans. The soil was a sandy loam with only moderate fertility. Stable manure at the rate of 20 tons per acre was spread broadcast in the spring and ploughed under. Ground limestone at the rate of one ton per acre was scattered broadcast and the ground disced, after which acid phosphate at the rate of 500 pounds per acre was put on and well harrowed in.

The ground was then levelled with the levelling harrow and the seed sown with the hand drill in rows 30 inches apart on the level without ridging the rows. Each plot was made up of two rows 66 feet long and 30 inches apart, or one one-hundredth and thirty-two of an acre. Duplicate plots were planted as indicated by the results tabulated below.

KENTVILLE.

TURNIPS.

Sixteen varieties of turnips were tested. The seed was sown May 18, and the crop harvested October 23. The plants were thinned to 1 foot apart. There was considerable clubroot in the plots, which disease seemed to be fairly well distributed throughout the different plots. The yield per acre from the different plots was as follows:—

TURNIPS.—Test of Varieties.

No.	Variety.	1st Plot Year per Acre.				2nd Plot Yield per Acre.				Average Yield per Acre.			
		Tons.	Lb.	Bush.	Lb.	Tons.	Lb.	Bush.	Lb.	Tons.	Lb.	Bush.	Lb.
1	Kangaroo	24	180	803	00	25	820	847	00	24	1,500	825	00
2	Perfection	22	1,540	759	00	25	820	847	00	24	180	803	00
3	Hazard's Improved	22	1,280	754	40	25	680	844	50	23	1,985	799	45
4	Skirvings	21	900	715	00	23	860	781	00	22	880	748	00
5	Corning's Lapland	22	1,540	759	00	21	1,960	732	40	22	750	745	50
6	Magnum Bonum	20	1,180	686	20	23	1,520	792	00	22	350	739	10
7	Hall's Westbury	22	1,540	759	00	21	500	708	20	22	20	733	40
8	Bangholm	23	860	781	00	20	1,050	684	10	21	1,955	732	35
9	Durham	21	900	715	00	22	880	748	00	21	1,890	731	30
10	Halewood's Bronze Top	20	1,580	693	00	20	920	682	00	20	1,250	687	30
11	Jumbo	20	920	682	00	20	1,320	688	40	20	1,120	685	20
12	Best of All	21	240	704	00	19	1,860	664	20	20	1,050	684	10
13	Hartley's Bronze Top	20	1,050	684	10	19	280	638	00	19	1,670	661	10
14	Canadian Gem	20	920	683	00	17	320	572	00	18	1,620	627	00
15	New Century	19	940	649	00	16	1,660	561	00	18	300	605	00
16	Empress	19	1,070	651	10	16	1,000	550	00	18	40	600	40
	Average	21	1,040	717	20	21	530	708	50	21	785	713	5

MANGELS.

Fourteen varieties of mangels for comparative test were seeded on May 18. These were harvested October 14. The plants were thinned to 10 inches apart. The yield per acre was as follows:—

MANGELS.—Test of Varieties.

No.	Variety.	1st Plot Yield per Acre.				2nd Plot Yield per Acre.				Average Yield per Acre.			
		Tons.	Lb.	Bush.	Lb.	Tons.	Lb.	Bush.	Lb.	Tons.	Lb.	Bush.	Lb.
1	Yellow Leviathan	25	820	847	00	20	1,880	698	00	23	350	772	30
2	Mammoth Long Red	22	1,800	763	20	21	770	712	50	22	285	738	5
3	Mammoth Prize Long Red	18	960	616	00	22	1,670	701	10	20	1,315	688	35
4	Danish Sludstrup	19	940	649	00	20	1,580	693	00	20	260	671	00
5	Mammoth Yellow Intermediate	19	540	642	20	20	1,920	698	40	20	230	670	30
6	Giant Half Sugar White	19	800	646	40	20	1,180	686	20	19	1,990	666	30
7	Selected Yellow Globe	21	240	704	00	18	1,620	627	00	19	1,930	665	30
8	Improved Mammoth Saw-Log	20	130	668	50	19	1,200	653	20	19	1,665	661	5
9	Elvethan Mammoth	18	810	613	50	20	920	682	00	19	865	647	45
10	Giant Yellow Intermediate	17	1,640	594	00	20	1,180	686	20	19	410	640	10
11	Perfection Mammoth Long Red	17	980	583	00	19	1,070	651	10	18	1,025	617	5
12	Golden Tankard	17	850	580	50	18	300	605	00	17	1,575	592	55
13	Gate Post	14	1,830	497	10	18	1,490	624	50	16	1,660	561	00
14	Giant Yellow Globe	16	600	543	20	17	580	576	20	16	1,590	559	50
	Average	19	353	639	13	20	97	668	17	19	1,225	653	45

CARROTS.

Seven varieties of carrots were tested in similar plots. The seed was sown May 18. The crop was harvested October 23. The plants were thinned to 4 inches apart in the row. The following yields were obtained:—

CARROTS.—Test of Varieties.

No.	Variety.	1st Plot Yield per Acre.		2nd Plot Yield per Acre.		Average Yield per Acre.	
		Tons. Lb.	Bush. Lb.	Tons. Lb.	Bush. Lb.	Tons. Lb.	Bush. Lb.
1	Svalof Champion	16 1,660	561 00	17 450	574 10	17 55	567 35
2	White Belgian	16 340	539 00	17 580	576 20	16 1,460	557 40
3	Ontario Champion	14 1,700	495 00	17 1,240	587 20	16 470	541 10
4	Mammoth White Intermediate	12 420	407 00	15 1,680	528 00	14 50	467 30
5	Champion	12 1,740	429 00	15 360	506 00	14 50	467 30
6	Improved Short White	14 1,040	484 00	12 1,080	418 00	13 1,060	451 00
7	Giant White Vosges	13 1,720	462 00	7 1,840	264 00	10 1,780	363 00
	Average	14 940	482 26	14 1,604	493 24	14 1,275	487 55

SUGAR BEETS.

Three varieties of sugar beets were tested. The seed was sown May 18 and the crop harvested October 14. The plants were thinned to 8 inches apart. The yield per acre was as follows:—

SUGAR BEETS.—Test of Varieties.

No.	Variety.	1st Plot Yield per Acre.		2nd Plot Yield per Acre.		Average Yield per Acre.	
		Tons. Lb.	Bush. Lb.	Tons. Lb.	Bush. Lb.	Tons. Lb.	Bush. Lb.
1	Vilmorin Improved A	13 330	438 50	11 1,230	387 10	12 780	413 00
2	Vilmorin Improved B	11 750	379 10	12 420	407 60	11 1,585	393 5
3	Klein Wanzleben	9 1,270	312 10	10 1,880	364 40	10 575	342 55
	Average	11 783	379 43	11 1,177	386 17	11 980	383 00

ALFALFA.

The alfalfa seeded in June, 1914, and reported upon last season, failed to start in the spring of 1915 except in places. An examination was made of the plants in the very early spring, when the crown of the plants seemed to be in perfect condition, and it was thought that they had passed the winter without injury. It was found later, however, that the roots had been damaged, and although some plants started they made very weak growth and the area was ploughed this fall. Certain places where the plants made exceptionally strong growth in 1914 did not suffer from winter injury and produced a fair crop. On the areas which were apparently lacking most in humus the plants were winter-killed the most. As stated in the previous report, the stand was very uneven, due to the uneven soil conditions, the land having been stumped the

year before. From observations on this area it would seem that it is quite necessary to prepare the ground by manuring it well and growing a hoed crop the previous year, thus furnishing a soil free from weeds and containing a good amount of humus.

GRIMM ALFALFA.

Six one-twentieth acre plots of Grimm alfalfa were sown May 27 at the rate of 20 pounds per acre. One one-fortieth acre plot was also sown. The one-twentieth acre plots are 33 feet by 66 feet, and the one-fortieth acre plots 33 by 33 feet, with a 4-foot space around each plot.

All the soil was limed with ground limestone, except plot 5, at the rate of 4,000 pounds per acre, which was well worked into the soil. A fertilizer made up of 600 pounds acid phosphate and 200 pounds nitrate of soda, at the rate of 500 pounds per acre, was scattered broadcast and well harrowed in. The plots were all treated with nitro-culture from Ottawa except Nos. 1, 3, and 4. Plot No. 1 was treated with nitro-culture from Macdonald College. Plot No. 3 was treated with 100 pounds soil from Ottawa taken from an alfalfa field, and plot No. 4 was not treated at all. The seed was sown broadcast and harrowed in lightly, whereupon the land was smoothed with the smoothing harrow and rolled.

The area had been taken out of stumps in 1912 and was seeded to oats in 1913, followed by potatoes in 1914. The soil is a poor sandy loam. It was manured for the potato crop at the rate of 400 pounds bone meal and a complete fertilizer, made up of 75 pounds sulphate of ammonia, 75 pounds nitrate of soda, 120 pounds muriate of potash, and 320 pounds 15 per cent acid phosphate, which was harrowed in at a rate of 600 pounds per acre.

The growth on these plots was very even and a mowing machine was run over the plots on September 3. The average yield of cured hay at this time was 1,100 pounds per acre. One half of each plot was mulched with strawy horse manure after the ground had lightly frozen on the 18th of November.

GRASS AND CLOVER PLOTS.

The land on which these plots are located was cleared of stumps in 1911 and 1912 and seeded to grain in 1913. In the fall of 1913 this ground was manured with ten tons stable manure per acre and then winter rye sown. The winter rye was cut for green feed in June, 1914, and the ground manured at the rate of 15 tons stable manure per acre and ploughed. It was seeded to turnips on July 4, and produced a crop of 490 bushels per acre. The land was then fall ploughed. It was worked up this spring with the wheel cultivator and limed at the rate of 1,500 pounds ground limestone per acre. This was well worked in and a fertilizer made up of 600 pounds acid phosphate and 200 pounds nitrate of soda was sown at the rate of 500 pounds per acre. The seed was sown broadcast both ways on each plot on May 26 and lightly harrowed in, after which the levelling harrow was put over the ground.

Each plot is one-eightieth acre or 16½ feet wide and 33 feet long. The space between plots on the sides is 3 feet, and between plots on the end 4 feet. There are 52 plots in the block. Each kind of grass and clover is sown in four plots of equal size at different places in the field. Two of these are to be used for seed purposes and two are to be cut and cured for hay.

The following varieties of grasses and clover were seeded with the quantity of seed as given per acre:—

12	pounds	Timothy.	30	pounds	Orchard grass.
20	"	Red Too.	25	"	Kentucky Blue grass.
40	"	Meadow fescue.	30	"	Sheep's fescue.
30	"	Perennial Rye grass.	40	"	Awnless Brome grass.
25	"	Canada Blue grass.	12	"	Red Clover.
7	"	Alsike clover.	20	"	Liscomb alfalfa.
20	"	Grimm alfalfa.			

The growth on all the plots was cut September 7, and after being cured the plots averaged per acre as follows:—

	Lb.
Timothy	3,680
Orchard grass	3,240
Meadow fescue	3,270
Kentucky blue grass	1,570
Awnless Brome grass	2,980
Perennial Rye grass	3,880
Canada Blue grass	3,840
Red Top	3,960
Sheep's fescue	1,340
Red clover	2,900
Alsike clover	3,740

GROWING FIELD ROOTS FOR SEED.

A number of roots were stored in the cellar in the fall of 1914 for seed purposes. These included mangels, turnips, and carrots. The roots were selected for uniformity of type and were of medium size. The mangels carried through the winter in excellent condition, but the carrots rotted badly and, in fact, were not fit for planting. The turnips appeared to be in good condition but failed to make satisfactory growth after they were planted and in very many cases rotted with the result that the stand for seed was very uneven.

One variety of mangels, the "Danish Sludstrup," was planted on a good, rich, well-prepared soil in rows 2½ feet apart and 2 feet apart in the rows. These made a strong growth but were late in maturing the seed. The fall, however, was open and the seed ripened well. The yield from one-twenty-eighth acre plot was 43 pounds, i.e. 1,204 pounds per acre. This seed has germinated well, in the greenhouse, 110 seed producing 193 strong plants.

Roots of the "Mammoth Long Red" were planted on a piece of new land at the rear of the farm. This soil was manured but the crops made very inferior growth and the crop of seed was much less than that on the older and better-prepared area. The yield per acre was 700 pounds. Tested in the greenhouse 110 seeds germinated 105 plants which were not so vigorous as the "Danish Sludstrup."

It would seem possible to develop a good quality of mangel seed under the climatic conditions of the district, but the roots should be planted on a well-prepared, thoroughly rich soil in order to develop large well-matured seed.

It seems desirable in order to carry turnips and carrots in ordinary cellar storage to use more care in the handling of the roots and in ventilation than is necessary for the mangel. In any case, unless one is prepared to give special attention in keeping the root storage house thoroughly ventilated, the chances are that the roots will not carry through in good condition.

This fall a number of roots of turnips, mangels and carrots were stored in a pit with the hope that they will carry through better than in the cellar. For comparison, a duplicate lot is being stored in the cellar.

KENTVILLE.

EXPERIMENTAL STATION, FREDERICTON, N.B.

REPORT OF THE SUPERINTENDENT, W. W. HUBBARD.

WEATHER CONDITIONS, 1915.

December 1914 was a very bright, dry month and the latter part was exceedingly cold. There was no snow on the ground and frost penetrated deeply. January, February, and March were unusually mild months, with but little precipitation. At no time was there more than 6 inches of snow on the ground and most of the time the fields were practically bare. From the 9th of March on there was no snow on the ground and warm days with freezing nights were very unfavourable for grasses and clovers. April was wet, with only 102 hours of bright sunshine. In May there were sixteen rainy days and the weather was cool all the time. The nights were cold but with no frost. June had twenty wet days and at no time during May or June was any but the very driest land in fit condition for cultivation so that nearly all crops were planted under unfavourable conditions. July had only fourteen rainy days, but on one of them there was a rainfall of 3·26 inches. August had thirteen wet days and up to the 1st September the nights were cold and the temperature throughout abnormally low. From May 1 to September 1 there was a rainfall of 19 inches. The average rainfall for these five months for the last forty-one years has been fourteen and one-third inches. The autumn months were, however, fine and warm giving ideal harvesting conditions.

While in many sections there was much low-lying land that was never cropped at all, yet on land that was sowed or planted the yields were fully better than might have been expected. There was no spring frost after May 1. The first autumn frost occurred on September 26, but was only felt in low spots. Potatoes and corn were partially killed on October 2, but not completely until October 11.

Some Weather Observations taken at Experimental Station, Fredericton, 1915.

Month.	Temperature F.			Precipitation.	Sunshine.
	Highest.	Lowest.	Mean.		
1915	°	°	°	Inches.	Hours.
January	50·5	—28·0	18·83	2·71	85·8
February	46·5	—20·5	21·75	2·47	107·9
March	46·5	6·5	27·9	0·62	121·35
April	63·0	21·0	40·6	3·175	102·75
May	75·0	30·0	47·4	4·995	180·8
June	84·0	32·0	60·4	4·98	174·85
July	85·0	40·0	66·3	4·87	227·05
August	85·0	36·5	64·1	4·12	161·34
September	82·5	32·0	56·6	2·75	158·0
October	74·0	26·0	47·0	2·38	147·3
November	57·0	17·0	35·4	2·66	76·3
December	47·0	3·0	24·6	4·495	61·65
Total for year				40·225	1605·09
Average for 41 years				43·8	1996·0
Total for 6 growing months, April to September 1915				24·89	1004·79
" 6 " April to September 1914				19·08	1304·2
" 6 " April to September 1913				16·9	1247·0

INDIAN CORN.

Field Crops.—Nine and six-tenths acres of newly cleared land was planted to White Cap Yellow Dent and Wisconsin No. 7 corn on the 12th and 13th June, the land being even then in a cold and saturated condition. Sixteen tons of barnyard manure was applied per acre and an attempt made to mix it with the soil with disk harrows. As it was impossible to get the manure into the land so that the corn planted would work, the land was ploughed to a depth of three inches. Basic slag at the rate of 400 pounds per acre was sown broadcast over the whole area, and on a portion of the land 50 pounds nitrate of soda, 50 pounds sulphate of ammonia, and 50 pounds potash were applied with the seed in the drill. The rows were 3½ feet apart. The ground was kept thoroughly cultivated and twice hand-hoed. Seed was sown at the rate of 1 bushel per acre. At the second hoeing the plants were thinned somewhat. The corn started very slowly and did not tassel till the latter part of August. There was no vigorous growth till after that. The corn was cut on the 28th September with but slight frost injury. The yield was as follows: White Cap Yellow Dent, with manure and basic slag, 5 tons 1,347 pounds per acre; with fertilizer added, 5 tons 1,855 pounds. Wisconsin No. 7, with manure and basic slag, 7 tons 351 pounds per acre; with fertilizer added, 6 tons 289 pounds. The crop was very uneven, partially drowned in places and did not have many ears developed when cut.

Two acres of the above varieties were planted on the 12th June on a sandy loam soil, which had been under cultivation for many years and manured in 1914 with 16 tons barnyard manure per acre for turnips. A similar application of manure was lightly ploughed in. On one acre there were applied additional 50 pounds nitrate of soda, 50 pounds sulphate of ammonia, 250 pounds acid phosphate, and 50 pounds muriate of potash; on the other acre nothing was applied beside barnyard manure. In the first instance the yield was 8 tons 480 pounds, and in the second 7 tons 1,260 pounds. Up till the latter part of August the fertilizer area looked to have nearly double the crop over where manure only was applied but during September the crop evened up so that it was difficult at harvesting to note any difference.

The ensilage from this crop did not heat up as corn usually does and it froze deeply in the silo. The ensilage, however, turned out well preserved and palatable.

Crows were very troublesome, as in previous years, and as soon as the corn was planted a boy with a shot-gun was kept in the field from 4 a.m. till 8 p.m. until the corn was 6 inches high.

Variety tests.—Eighteen plots of corn were planted on June 3 on a sandy loam soil fairly well drained. It was fall-ploughed after a turnip crop, the fertilizing for which was 16 tons of barnyard manure and 300 pounds basic slag with 265 pounds 3-9-4 fertilizer applied in a row. In 1915 sixteen tons of barnyard manure were applied and lightly ploughed in. No other fertilizer was applied. The plots received weekly cultivation till August 15, and were harvested on October 12 with but slight damage from frost. The seed for six of the eighteen plots was supplied by the New Brunswick Department of Agriculture as part of a series of tests being made by farmers in different parts of the province. These plots have the letters "N.B." after the name of the variety.

INDIAN CORN.—Test of Varieties.

No.	Variety.	Height.		Degree of Maturity.		
		Ft.	In.		Tons.	Lb.
1	North Dakota, N.B.	6	6	Watery	13	1,600
2	King Philip	7	6	"	13	1,000
3	Longfellow, N. B.	6	0	Thin milk	13	
4	Longfellow	6	6	"	12	1,200
5	Wisconsin No. 7	7	0	Watery	12	1,000
6	White Cap Yellow Dent	7	0	Thin milk	12	600
7	Compton's Early N. B.	6	8	"	12	600
8	Canada Yellow	4	6	Glazed	12	400
9	Native Corn (from Bear Island)	4	8	Some ripe and some glazed	11	400
10	Free Press	5	0	" " "	11	
11	Salzer's North Dakota	6	6	Watery	10	800
12	Compton's Early	6	0	Thin milk	9	1,600
13	Bailey	7	0	Watery	9	1,600
14	Howie	7	0	"	9	600
15	Golden Glow, N. B.	6	0	Thin milk	9	400
16	Quebec No. 28, N. B.	5	6	Some glazed, some ripe	8	1,200
17	Leaming	7	6	Kernels just forming	8	1,000
18	Quebec Yellow, N. B.	4	6	Glazed	7	400
				Average:	10	1,877

FIELD ROOTS.

TURNIPS.

Field Crops.—Four acres were sown with sixteen varieties of turnips, the same as in the test plots, from June 5 to 9, excepting a small area sown to Invicta on the 14th, and another few rows on the 29th. The land was a fairly heavy loam that was manured in 1913 for turnips with sixteen tons of barnyard manure per acre, and in 1914 for corn with sixteen tons barnyard manure per acre. In 1915 a portion of the field was sown to turnips without any fertilizer a part with an application of 500 pounds basic slag per acre and another part with a similar quantity of slag and an additional application, consisting of 50 pounds nitrate of soda, 50 pounds sulphate of ammonia, 250 pounds acid phosphate, and 50 pounds muriate of potash. The resulting yields were:—

Portion of field with no fertilizer	bush. per acre.	523
" " basic slag only	"	698·7
" " complete fertilizer	"	876

Of the last portion of the field there was some reduction in yield on account of Club Root occurring at several places.

FREDERICTON.

On June 30 an acre and a quarter of Invicta swedes was sown. The land was newly underdrained. It was manured with 16 tons barnyard manure per acre in 1914 for corn and with 16 tons barnyard manure per acre again in 1915. Acid phosphate at the rate of 480 pounds per acre was applied in the drills. The yield was 921 bushels per acre.

On July 1 and 2, 2½ acres of newly broken land was sown to turnips. The land was manured at the rate of 16 tons barnyard manure to the acre. Varieties sown were "Elephant Swede" and "Greystone." Basic slag at the rate of 400 pounds per acre was applied. Much of the ground was too wet for best results. The yield was 793 bushels per acre.

On July 15, 20 and 22, 2¾ acres of white turnips (Ewing's Improved Mammoth Purple Top) were sown. They averaged 917 bushels per acre.

Variety tests.—Nineteen plots of one-twentieth acre each were sown with varieties named below on June 2 and 3. The soil was a sandy loam, which was manured in 1913 for corn with 16 tons of manure and 468 pounds of 3·6-10-5·5 fertilizer to the acre, and again in 1914 for turnips with a similar quantity of manure and 265 pounds fertilizer per acre. In 1915, 16 tons of barnyard manure was again applied and lightly ploughed in. No other fertilizer was used. This continuance of hoed crops was kept on this land because it was so foul with mustard that it was useless to sow grain. The turnips were seeded on the flat in rows 30 inches apart, thinned when in the third leaf to 12 inches apart, and cultivated as nearly as possible once a week throughout the season until the tops completely covered the ground. The crop was harvested on the 27th October.

TURNIPS.—Test of Varieties.

No.	Variety.	Yield per Acre.			
		Tons.	Lb.	Bush.	Lb.
1	Jumbo	37	1,600	1,260	00
2	Empress	36	1,680	1,228	00
3	Canadian Gem	36	1,440	1,224	00
4	Magnum Bonum	36	720	1,212	00
5	Hazard's Improved	35	800	1,180	00
6	Skirving	35	800	1,180	00
7	Durham	35	80	1,168	00
8	Corning's Lapland, N.B.	34	1,840	1,164	00
9	Hartley's Bronze Top	34	800	1,148	00
10	Hall's Westbury	33	1,680	1,128	00
11	Good Luck	33		1,100	00
12	Perfection	32	800	1,080	00
13	Halewood's Bronze Top	31	1,360	1,056	00
14	Kangaroo	31	400	1,040	00
15	Corning's Lapland	30	1,680	1,028	00
16	New Century	30	1,680	1,028	00
17	Bangholm, N. B.	30	1,680	1,028	00
18	Best of All	29	1,280	988	00
19	Bangholm	25	1,600	860	00
	Average	33	632	1,100	32

FREDERICTON.

MANGELS.

The land used for the experiment with mangels was treated as described above for that allotted to the experiment with turnips.

MANGELS.—Test of Varieties.

No.	Variety.	Yield per Acre.			
		Tons.	Lb.	Bush.	Lb.
1	Yellow Globe	35	980	1,183	00
2	Golden Tankard	18	.....	600	00
3	Danish Sludstrup	17	1,280	583	00
4	Saw-Log	7	1,780	263	00
	Average	19	1,510	658	39

CARROTS.

Seven varieties were tested on land treated as described above for turnips. The seed was sown June 3 on the flat in rows 30 inches apart. The plants were thinned to from 3 to 4 inches apart. Harvesting took place October 26.

CARROTS.—Test of Varieties.

No.	Variety.	Yield per Acre.			
		Tons.	Lb.	Bush.	Lb.
1	Improved Short White	22	640	744	00
2	White Belgian	20	1,700	695	00
3	Champion	19	1,300	665	00
4	Mammoth White Intermediate	17	1,520	592	00
5	Svalof Champion	17	800	580	00
6	Giant White Vosges	16	1,600	560	00
7	Ontario Champion	13	1,840	464	00
	Average	18	771	612	51

SUGAR BEETS.

Four varieties were tested on land treated as described above for turnips.

SUGAR BEETS.—Test of Varieties.

No.	Variety.	Yield per Acre.			
		Tons.	Lb.	Bush.	Lb.
1	Mowbray	11	1,640	394	00
2	Klein Wanzleben	11	560	376	00
3	Vilmorin's Improved	10	1,240	354	00
4	FrenchVery Rich	9	1,860	331	00
	Average	10	1,825	363	45

FREDERICTON.

TURNIP SEED PRODUCTION.

In the autumn of 1914, 7,295 roots of Kangaroo swede turnips were stored with roots and crown intact for planting for seed production. On May 26 these roots were taken from the cellar, but only 3,360 were sound enough to plant. Furrows of 20 inches were made about 9 inches deep in sets of four. A space of 3 feet was left between each set. One-third of an acre was occupied in this way. The roots were placed 20 inches apart in the furrows and covered so that just the crown was exposed. The land had been manured with 16 tons barnyard manure to the acre in 1913 and 1914 and received no manure or fertilizer in 1915. Sprouts started within a few days from planting and the stalks grew rapidly to a height of from 36 to 44 inches and blossomed profusely. About twenty per cent of the roots rotted too rapidly in the ground to give strong stalks. Supporting stakes were driven and two wires were stretched round each set of furrows to hold the stalks together and prevent threshing in the wind.

The seed ripened very unevenly. The lower branches of nearly all stalks ripened off while the tops were still in bloom. As soon as there were any ripe seeds English sparrows and other birds were on hand in thousands to start the harvest and they took a large toll before it was considered desirable to cut and stook the crop. The stalks were tied into sheaves and stooked, and each stook was covered with a cotton cap and allowed to stand till the stalks were thoroughly dry. One hundred and eighty pounds of excellent seed was reclaimed with an ordinary grain thresher. It was estimated that more than this amount was lost by birds and shelling on the ground. The crop was cut and stooked on the 28th August. After drying for ten days it was taken to the barn and threshed.

GRASSES AND CLOVERS—TEST OF VARIETIES.

Plots of one-eightieth acre each were sown of the following grasses and clovers:—

	Date of Seeding.	Height, Aug. 15. Inches.
Timothy	May 31	12
Orchard grass	" 31	9
Red Top	" 31	9
Kentucky Blue grass	" 31	5
Meadow fescue	" 31	11
Sheep's fescue	" 31	2
Western Rye grass	" 31	12
Perennial rye grass	" 31	9
Red clover	" 31	11
Alsike clover	" 31	12
Grimms alfalfa	" 31	14

The growth on half the area of each of the above plots was cut on the 15th September and removed. The other half was allowed to stand uncut. This was done to ascertain if the removal of the crop as late as September 15 would have any injurious effect on the roots of the grasses and clovers.

ALFALFA.

An acre of land that had been in hoed crop in 1913 and 1914 and manured both years was thoroughly cultivated up till the 20th July, when it received 400 pounds of basic slag. It was then seeded with 25 pounds Liscomb alfalfa. One-half of the acre, divided longitudinally, was top-dressed with 1 ton of ground limestone. The acre was also divided into thirds, transversely. The seed for one-third was treated with alfalfa nitro-culture. A ton of inoculated soil was spread on another third and

harrowed in immediately, and the remaining third was untreated. The alfalfa made an even growth over the whole area, and no difference could be detected between the different areas. The plants were allowed to grow until killed by frost, when they had reached a height of 12 inches. Nodules were observed on the roots of plants on all parts of the acre, but there were fewer on the untreated portion. All parts of the acre wintered well and nodules are in evidence on the untreated as well as the inoculated areas.

A plot of alfalfa seeded early in July, 1914, gave a vigorous growth in the spring of 1915. Cutting began on June 1, when it was about 15 inches high, and a part of the plot was taken for green feed for poultry. A small portion of the first growth was left to bear seed. The balance of the plot was cut for hay on July 6. A second cut was taken off as it began to blossom on August 20, and the third growth of 15 inches was taken off 1st October. The growth that started after the cutting during the first week in June ripened seed practically as early as that which was not cut at all. A small quantity of seed was threshed out and cleaned up.

RED CLOVER.

Part of a second crop of red clover was cut and dried for seed. Much of the seed was unripe and shrivelled. It was threshed with an ordinary threshing machine, after the cylinder had been boxed in so that the stalks could only escape very slowly.

ANNUAL FORAGE CROPS.

One-quarter acre of Dwarf Essex rape was sown on 16th July, and gave 4 tons of green fodder in October. It was sown in rows, manured at the rate of 16 tons per acre and cultivated the same as turnips.

Peas, Oats, and *Barley* were sown for a soiling crop at the rate of one and one-third bushels of peas, two and one-third bushels of oats, and one-half bushel of barley per acre, and gave 13 tons to the acre of green fodder. The peas were sown and ploughed in on May 7, and the oats and barley sown and harrowed in one week later.

Oats and *Vetches* were sown for green feed on June 6, and gave a green crop of 12 tons per acre.

EXPERIMENTAL STATION, STE. ANNE DE LA POCATIERE.

REPORT OF THE SUPERINTENDENT, JOS. BEGIN.

The spring of 1915 was later and colder than any other spring on record in the district for a long time. The frost did not quite leave the ground until the middle of May and the growth was at least two weeks behind, as compared with ordinary years. The months of May and June were wet and cold with a few spells of warm weather which did not last more than a day. The roots and corn were not sown until from May 25 to June 6, because the soil was not warmed up sufficiently until that time. The germination of turnips was good and prompt, while mangels, carrots, and Indian corn germinated slowly on account of lack of heat. A dry spell followed which proved very unfavourable to growth in general. In fact from June 25 to July 31 the total precipitation was not more than 1·81 inches. The months of August and September were not favourable for forage plants and, as a matter of fact, it was not until too late a date that the plants were able to pick up. The fall was very fine and without damaging frosts in September. This enabled the corn to grow until the last days of September, and permitted of harvesting the crop in very good condition.

VARIETY TESTS.

In order to secure the necessary uniformity of soil for the experiments with the varieties of forage plants, a piece of land rather poor in fertility had to be chosen. The soil was sandy loam fairly well suited to carrots, Indian corn and turnips, but less suitable to mangels. The land had been summer-fallowed in 1914 with a view of killing the couch grass and in order to prepare the soil for potatoes in 1915. Manure at the rate of 20 tons per acre was uniformly applied in the fall of 1914 and thoroughly incorporated with the soil by discing. The land was completely free from weeds including the couch grass which had been destroyed by the previous summer-fallow.

The test was conducted in duplicate one-hundredth acre plots and the final yield computed from the average of the two plots.

The seed was sown on June 6 and the crop harvested on September 22.

INDIAN CORN for Ensilage.—Test of Varieties.

No.	Variety.	Average Height.	Stage of Maturity.	Yield per Acre.					
				1st Plot.		2nd Plot.		Average.	
				Tons.	Lb.	Tons.	Lb.	Tons.	Lb.
1	Wisconsin No. 7	82	Some ripe ears	12	800	12	1,100	12	950
2	Compton's Early	84	Late Milk	12	200	12	600	12	400
3	Bailey	85	Late Dough	11	850	11	800	11	825
4	Leaming	84	Late Milk	11	400	11	550	11	475
5	North Western Dent	80	Late Dough	10	1,500	10	900	10	1,200
6	White Cap Yellow Dent	72	"	10	900	10	500	10	700
7	Longfellow	72	Milk	8	500	8	850	8	675
8	Salzer's North Dakota	68	"	7	900	7	1,200	7	1,050
9	Golden Glow	80	"	7	800	7	950	7	875
10	King Philip	72	"	7	200	7	550	7	375
11	Free Press	50	Many ripe ears	6	1,800	6	1,500	6	1,650
12	Quebec Yellow	50	"	6	400	6	200	6	300
13	Canada Yellow	48	"	5	800	5	900	5	850
14	Gehu	48	"	5	200	5	400	5	300
	Average			8	1,446	8	1,500	8	1,473

Field Crops.—Ten acres of Indian corn gave an average of 11 tons to the acre. This yield is the best that has been obtained so far at the Station. The varieties used were Longfellow, which was sown on 8 acres, Wisconsin No. 7 and Compton Early, which were sown on 1 acre each. The germination of the corn was slow on account of the rather cold weather which followed the seeding. The average temperature for June was 57 degrees which, however, is far from enough for rapid growth of corn.

TURNIPS.

Of the fourteen varieties of turnips tested at this Station, Magnum Bonum, and Skirving gave the heaviest yields. All varieties were sown in duplicate plots one-hundredth of an acre in size and quite uniform as to soil conditions. The yield was rather small on account of the lack of fertility of the soil used for this experiment and on account of the drought of the month of July which seriously interfered with the growth. All varieties were thinned in such a way as to leave about the same number of roots growing on each plot. Seeding was done on May 25 and the crop harvested October 22. In the following is given the yield of each variety per acre.

TURNIPS.—Test of Varieties.

No.	Variety.	1st Plot Yield per Acre.		2nd Plot Yield per Acre.		Average Yield per Acre.	
		Tons. Lb.	Bush. Lb.	Tons. Lb.	Bush. Lb.	Tons. Lb.	Bush. Lb.
1	Skirving's	18 1,600	626 40	18 1,400	623 20	18 1,500	625 00
2	Magnum Bonum	18 1,200	620 00	18 400	606 40	18 800	613 20
3	Canadian Gem	18 200	603 20	17 800	580 00	17 1,500	591 40
4	New Century	17 1,800	596 40	17 200	570 00	17 1,000	583 20
5	Hall's Westbury	15 00	500 00	18 1,400	623 20	16 00	561 40
6	Best of All	17 00	566 40	16 800	546 40	16 1,400	556 40
7	Jump	16 1,200	553 20	16 400	540 00	16 800	546 40
8	Good Luck	16 00	533 20	16 1,000	550 00	16 500	541 40
9	Kangaroo	16 200	536 40	15 800	513 20	15 1,500	525 00
10	Hartley's Bronze Top	16 1,600	560 00	14 400	473 20	15 00	516 40
11	Perfection	15 00	500 00	15 1,000	516 40	15 500	508 20
12	Empress	14 1,400	490 00	15 600	510 40	15 00	500 00
13	Hazard's Improved	14 1,800	496 40	14 1,200	486 40	14 1,500	491 40
14	Corning's Lapland	14 00	466 40	14 1,000	483 20	14 500	475 00
	Average	16 785	546 25	16 671	544 31	16 728	545 28

MANGELS.

Nine varieties of mangels were sown on the 25th of May in duplicate plots one-one hundreth of an acre in size. The land was quite uniform in character but of nature not very well suited to the growing of mangels. The chemical composition of the soil was not such as is favourable for the securing of a maximum yield of this crop. The yield was also unfavourably influenced by the drought, but was low especially because the roots were not grown in the best kind of soil. The crop was harvested on October 22. In the following is given the yield of each variety per acre.

MANGELS.—Test of Varieties.

No.	Variety.	1st Plot Yield per Acre.		2nd Plot Yield. per Acre.		Average Yield per Acre.	
		Tons. Lb.	Bush. Lb.	Tons. Lb.	Bush. Lb.	Tons. Lb.	Bush. Lb.
1	Danish Sludstrup	14 600	476 40	12 1,400	423 20	13 1,000	450 00
2	Giant Yellow Intermediate	13 00	433 20	12 1,000	416 40	12 1,500	425 00
3	Elevethan Mammonth	12 1,000	416 40	12 00	400 00	12 500	408 20
4	Gate Post	12 800	413 20	12 00	400 00	12 400	406 40
5	Giant Half Sugar White	11 1,600	393 20	11 1,600	393 20	11 1,600	393 20
6	Prize Mammoth Long Red	11 1,000	383 20	11 600	376 40	11 800	380 00
7	Golden Tankard	10 1,600	360 00	11 1,400	390 00	11 500	375 00
8	Improved Mammoth Saw Log	10 1,000	350 00	11 1,600	393 20	11 300	371 40
9	Yellow Globe	6 1,000	216 40	9 00	300 00	7 1,500	258 20
	Average	11 955	382 35	11 1,289	388 9	11 1,122	385 22

CARROTS.

Six varieties of carrots were tested in plots one one-hundredth of an acre in size. The soil was quite uniform, but too poor to ensure the best yield of this crop. However, the nature of the soil was quite favourable for carrots. The drought of the month of July reduced the crop considerably, as was the case for all the other crops. The seed was sown on May 22 and the crop harvested October 22. In the following is given the yield per acre of each variety:—

CARROTS.—Test of Varieties.

No.	Variety.	1st Plot Yield per Acre.		2nd Plot Yield per Acre.		Average Yield per Acre.	
		Tons. Lb.	Bush. Lb.	Tons. Lb.	Bush. Lb.	Tons. Lb.	Bush. Lb.
1	Improved Short White	12 1,000	416 40	16 600	543 20	14 800	480 00
2	Ontario Champion	12 1,000	416 40	15 600	510 00	14 1,800	463 20
3	White Belgian	12 00	400 00	15 800	513 20	13 1,400	456 40
4	Svalof Champion	12 1,800	430 00	13 1,600	460 00	13 700	445 00
5	Giant White Vosges	13 00	433 20	12 1,400	423 20	12 1,700	428 20
6	Champion	12 800	413 20	13 600	443 20	12 1,700	428 20
	Average	12 1,100	418 20	14 933	482 13 13	13 1,017	450 17

STE. ANNE DE LA POCATIÈRE.

SUGAR BEETS.

Three varieties of sugar beets were sown on May 25 on land quite similar to that allotted to mangels. They were pulled on October 22 and yielded as follows:—

SUGAR BEETS.—Test of Varieties.

No.	Variety.	1st Plot Yield per Acre.		2nd Plot Yield per Acre.		Average Yield per Acre.	
		Tons. Lb.	Bush. Lb.	Tons. Lb.	Bush. Lb.	Tons. Lb.	Bush. Lb.
1	Klein Wanzleben	12 1,600	426 40	10 800	346 40	11 1,200	386 40
2	Improved Vilmorin "A"	10 400	340 00	8 600	276 40	9 500	308 20
3	Improved Vilmorin "B"	8 1,000	283 20	9 1,600	326 40	9 300	305 00
	Average	10 1,000	350 00	9 1,000	316 40	10 00	333 20

FIELD CROPS OF MANGELS.

Two acres of mangels of the Magnum Bonum variety were seeded in the regular rotation and yielded an average of 20 tons 200 pounds, which is much more than the yield obtained in the variety tests. This difference of yield was due especially to the soil in the regular rotations being much richer than that used for the comparative variety tests. The soil was also more moist in character and as a consequence suffered less from the drought in the month of July.

EXPERIMENTAL STATION, CAP ROUGE, QUE.

REPORT OF THE SUPERINTENDENT, GUS. A. LANGELIER.

THE SEASON.

Taken as a whole, the months of May, June, July, August, September were a little warmer, drier, and duller than the average for the last three years; the mean temperature for this period in 1915 was 1·07 degrees higher, the precipitation 0·67 inch less, and the number of hours of sunshine 5·2 fewer than during 1912-13-14. The growing season was about thirty days longer than usual, the last killing frost occurring on May 16 and the first one on October 23. Corn for silage and swedes were a little above and hay below the average of the last five years, whilst other roots were about as usual.

VARIETY TESTS.

The trial plots of corn and roots come in a regular three-year rotation and are followed by grain and hay. They are located on a rather poor, but quite uniform, piece of sandy loam with a shale subsoil at from 18 to 24 inches from the surface. The land was ploughed shallow as soon as the hay was off in 1914, manured at the rate of 20 tons per acre, cultivated three or four times before the middle of October, then cross-ploughed, disced, twice, and ribbed up for the winter. In the spring of 1915 it was double-disced twice, drag harrowed, and rolled. Corn was sown in hills 3 feet apart in all directions and then harrowed; for roots, the land was put up in ridges 28 inches apart. Corn was thinned to four plants per hill, whilst carrots were singled to 6 inches and mangels, sugar beets and swedes to 8 inches apart in the rows. The cultivator was passed practically every week and weeds were pulled where the machine could not reach them. Check rows were used on each side of the different kinds of forage crops, so that the varieties at the ends did not get more light, air, or plant food than the others. Nothing was injured by disease, insects, birds, or other causes. All plots were in duplicate, so as to minimize the chances of error, and were of one one-hundredth acre.

INDIAN CORN FOR ENSILAGE.

Fifteen varieties were tested: Bailey, Canada Yellow, Compton Early, Early Longfellow, Free Press, Gehu, Golden Glow, King Philip, Leaming, Ninety Days, North Western Dent Salzer's North Dakota, White Cap Yellow Dent, Wisconsin No. 7. They were sown on May 25 and cut on September 27, which gave them a longer growing period, 125 days, than can generally be depended upon in this district without having frost. But the drought of midsummer practically brought all the corn to a standstill for nearly a month, and this setback could not be compensated by the same length of time later on when the weather was too cool for a heat-loving plant like corn. The average for all varieties was only 12,423 pounds per acre, but this was partly due to bad germination of certain varieties, for the field crop of Longfellow gave 17,264 pounds per acre.

The varieties of corn tested can be divided into three classes: the heavy yielders, which do not reach a point of maturity when they can make good silage; the early kinds, which do not give a high enough tonnage, and the ones which reach the dough

stage and are in the intermediate class as yielders. Of course, it is hard to draw a rigid line between the groups, but, to the present it can be said that Compton's Early, Golden Glow, Leaming, White Cap, Yellow Dent and Wisconsin No. 7 are not early enough, whilst Canada Yellow, Free Press, Gehu, King Philip, Ninety Days and Quebec Yellow do not give sufficient tonnage. Amongst the varieties which are fair yielders and are early enough may be mentioned Bailey, Longfellow, North Western Dent and Salzer's North Dakota. Longfellow seems the best adapted to the climatic conditions of Central Quebec and is recommended to farmers until a better variety is found.

FIELD ROOTS.

The piece of land on which are the trial plots is a rather dry sandy loam, on which swedes come fairly well, but where mangels, carrots and sugar beets are practically always a failure. An analysis of the soil made by the Division of Chemistry showed a lack of lime, and this was applied. Whilst it had a beneficial effect on barley and wheat and a most marked effect on clover following grain, it does not seem to have solved the problem regarding mangels, carrots and sugar beets. An experiment will be started in 1916 to find out if flat culture would not be better than ridges to help out the generally bad germination of seeds.

TURNIPS.

Fifteen varieties were on trial: Best of All, Canadian Gem, Corning Lapland, Durham, Empress, Good Luck, Hall Westbury, Hartley Bronze Top, Hazard Improved, Jumbo, Kangaroo, Magnum Bonum, New Century, Perfection, Skirving's. They were sown on May 20 and pulled on October 9, which gave them a growing period of 142 days. The average for all of them was 21,280 pounds per acre, with Hall's Westbury on top giving 26,100 pounds. The average for five years, however, places Good Luck at the head with 42,197 pounds per acre and this is the variety which is recommended to farmers of this district. It is possible, though, that after a few years other varieties may show their superiority.

The following table gives details about the crop of 1915:—

TURNIPS.—Yield in 1915.

No.	Name of Variety.	Date of Sowing.	Date of Pulling.	Yield per Acre.			
				Tons.	Lb.	Bush.	Lb.
1	Hall's Westbury	May 20..	Oct. 9..	13	100	435	00
2	Good Luck	" 20..	" 9..	13	50	434	10
3	Hazard's Improved	" 20..	" 9..	13	50	434	10
4	Canadian Gem	" 20..	" 9..	12	850	414	10
5	Magnum Bonum	" 20..	" 9..	12	300	405	00
6	Jumbo	" 20..	" 9..	11	1,350	389	10
7	New Century	" 20..	" 9..	11	1,050	384	10
8	Perfection	" 20..	" 9..	11	600	376	40
9	Hartley's Bronze Top	" 20..	" 9..	11	250	370	50
10	Skirving's	" 20..	" 9..	9	300	305	00
11	Corning's Lapland	" 20..	" 9..	8	1,750	295	50
12	Durham	" 20..	" 9..	8	1,050	284	10
13	Kangaroo	" 20..	" 9..	8	550	275	50
14	Best of All	" 20..	" 9..	7	1,950	265	50
15	Empress	" 20	" 9..	7	1,000	250	00
	Average	.....	.....	10	1,280	354	40

MANGELS.

Ten varieties were in the test plots: Danish Sludstrup, Elvethan Mammoth, Giant Half Sugar White, Gate Post, Giant Yellow Intermediate, Golden Tankard, Improved Mammoth Long Red, Mammoth Yellow Intermediate, Prize Mammoth Long Red, Selected Yellow Globe. They were sown on May 20 and pulled on October 18, which gave them a growing period of 151 days. As the crop was practically a failure, no figures are offered. The variety which has done best since 1911 inclusively is Giant Yellow Intermediate.

CARROTS.

Seven varieties were under test: Champion, Giant White Vosges, Improved Short White, Mammoth White Intermediate, Ontario Champion, Svalof Champion, White Belgian. They were sown on May 21 which gave them a growing period of 153 days. As usual, germination was very bad and the crop was a poor one. The varieties which, since five years, have shown themselves the best yielders are, in order of merit: Improved Short White, White Belgian, Ontario Champion, and Mammoth White Intermediate.

SUGAR BEETS.

Three varieties were on trial: Improved Vilmorin A, Improved Vilmorin B, and Klein Wanzleben. They were sown on May 21 and pulled on October 13, which gave them a growing period of 145 days. As with mangels and carrots, the crop was poor, the stand being so thin that only a few plants could be seen here and there. Klein Wamzleben has shown itself the heaviest yielder during five years.

SELECTION AND PROPAGATION OF GOOD STRAINS.

Grasses and Clovers.—Duplicate plots have been sown of the following grasses and clovers: Kentucky Blue grass, Meadow fescue, Orchard grass, Perennial Rye grass, Red Top, Sheep's fescue, Timothy, Western Rye grass, Alfalfa (Grimm's), Alsike, Red clover. A series of plots will be used to determine the quantity of hay given, whilst the other will be kept for seed production. As only the hardiest plants will live through the winter, the experiment involves a natural selection, whereby, it is hoped, the best strains may be isolated.

Quebec Yellow Corn.—From poultry keepers and others who would like to raise most of the food given to their stock, inquiries are often received whether it is possible to grow corn for grain in this district. For the purpose of gathering data on this subject, about one-quarter acre of Quebec Yellow corn was planted. It matured very well. As the frost-free season was an exceptionally long one, this work will have to be continued a few years. A number of good ears were chosen from the best plants, and a few strains will be isolated by the ear to row method.

CAP ROUGE.

EXPERIMENTAL STATION, LENNOXVILLE, QUE.

REPORT OF THE SUPERINTENDENT, J. A. McCLARY.

CHARACTER OF THE SEASON.

The season of 1915-16 on the whole was fairly favourable for forage crops. The small amount of snow on the ground during the winter of 1914-15 made it difficult for the young clover plants to survive, but with the favourable weather during the months of May, June, and July, an average crop of hay of principally timothy was harvested.

The precipitation during the months of May, June and July was favourable for the root crop which was an average crop in this district, but not altogether favourable for Indian corn, which requires plenty of sunshine and heat to make a rapid start. However, with the bright warm days of August and September there was a marked improvement on this crop, although it was not up to the average in the Eastern Townships.

The late fall of 1915 was very favourable for the new-seeded clover which went into the winter with a good aftermath, and from all appearances it has come through the winter very favourably.

INDIAN CORN.

Seventeen varieties were tested in 1915 on a light loam. This land was summer-fallowed with an application of 15 tons of barnyard manure per acre, applied and disced in during the fall. The land was divided off into duplicate plots of one-one hundreth acre each or two rows 75½ feet long and 36 inches apart. The corn was planted on May 26 and cultivated every week as the cultivator could be used. The crop was cut September 22. The following table gives results of the varieties tested:—

INDIAN CORN FOR ENSILAGE.—Test of Varieties.

No.	Variety.	Average Height.	Stage of Maturity.	Yield per Acre.					
				1st Plot.		2nd Plot.		Average.	
		Inches.		Tons.	Lb.	Tons.	Lb.	Tons.	Lb.
1	Compton's Early	95	Milk	23	300	20	1,200	21	1,750
2	Salzer's North Dakota	99	Milk	22	600	19	800	20	1,700
3	Early Longfellow	92	Milk	20	1,700	20	100	20	900
4	Wisconsin No. 7	95	Milk	18	1,950	18	1,250	18	1,600
5	Golden Glow	96	Dough	18	1,200	18	1,750	18	1,475
6	Leaming	84	Dough	18	1,650	17	1,500	18	575
7	King Philip	90	Milk	19	500	16	1,500	18	
8	Howie	78	Milk	18	1,600	15	600	17	100
9	Bailey	95	Early Dough	14	1,000	14	1,700	14	1,350
10	North Western Dent	83	Dough	14	1,800	13	1,000	14	400
11	White Cap Yellow Dent	98	Milk	17	350	11	400	14	375
12	Quebec Yellow	70	Glazed	12	1,800	10	400	11	1,100
13	Early Northern	86	Glazed	12	1,050	8	1,500	10	1,275
14	Canada Yellow	63	Glazed	10	700	8	1,000	9	850
15	Free Press	64·5	Dough	10	400	8	1,200	9	800
16	Ayer's Cliff Special	64	Ripe	8	300	9	400	8	1,350
17	Gehu	64	Glazed	8	450	6	200	7	325
			Average	15	1,727	14	29	14	1,878

TURNIPS.

Seventeen varieties of swede turnips were tested out in 1915 on a clay loam. This land was in oats the previous year, when 20 tons of manure per acre were applied and ploughed in. It was disced and worked into proper condition for ridging. The land was divided into plots of one-one-hundredth acre each, or two rows 28 inches apart and 92¾ feet long. The seed was sown on May 25, and the crop harvested on October 25.

TURNIPS.—Test of Varieties.

No.	Variety.	1st Plot Yield per Acre.		2nd Plot Yield per Acre.		Average Yield per Acre.	
		Tons.	Bush. Lb.	Tons. Lb.	Bush. Lb.	Tons. Lb.	Bush. Lb.
1	Corning's Lapland	26 650	877 30	30 550	1,009 10	28 600	943 20
2	Hall's Westbury	28 1,000	950 ..	27 1,300	921 40	28 150	935 50
3	Mangum Bonum	26 1,900	898 20	27 650	910 50	27 275	904 35
4	Hartley's Bronze Top	25 1,900	865 ..	26 1,750	895 50	26 825	880 25
5	Kangaroo	24 200	803 20	27 50	900 50	25 1,125	852 5
6	Good Luck	25 50	834 10	25 1,500	858 20	25 775	846 15
7	Perfection	24 650	810 50	24 1,050	817 30	24 850	814 10
8	Jumbo	23 .	766 40	25 250	837 30	24 125	802 5
9	Perfect Model	23 1,350	789 10	24 800	813 20	24 75	801 15
10	Best of All	22 1,550	759 10	24 1,900	831 40	23 1,725	795 25
11	Hazard's Improved	22 850	747 30	24 500	808 20	23 675	777 55
12	New Century	21 1,100	718 20	24 350	805 50	22 1,725	762 5
13	Durham	20 1,550	692 30	24 1,650	827 30	22 1,600	760 ..
14	Skirving's	21 550	709 10	23 ..	766 40	22 275	737 55
15	Empress	24 50	800 50	20 300	671 40	22 175	736 15
16	Canadian Gem	22 1,550	779 10	21 150	702 30	21 1,850	730 50
17	Non plus Ultra	20 750	679 10	23 150	769 10	21 1,450	724 10
	Average	23 1,509	791 49	24 1,935	832 15	24 722	812 2

MANGELS.

Twelve varieties of mangels were grown in uniform test rows in the same manner as described for swedes. The seed was sown on May 25, plants thinned to 8 inches apart, and the crop harvested on October 20.

MANGELS.—Test of Varieties.

No.	Variety.	1st Plot Yield per Acre.		2nd Plot Yield per Acre.		Average Yield per Acre.	
		Tons. Lb.	Bush Lb.	Tons. Lb.	Bush. Lb.	Tons. Lb.	Bush. Lb.
1	Best of All	21 1,800	740 .	26 1,400	890 ..	24 600	810 ..
2	Danish Sludstrup	20 1,000	783 20	27 700	911 40	23 1,850	797 30
3	Giant Yellow Intermediate	20 400	673 20	25 1,500	858 20	22 1,950	765 50
4	Elvetham Mammoth	18 ..	600 ..	27 100	901 40	22 1,050	750 50
5	Giant Half Sugar White	18 200	603 20	22 1,300	755 ..	20 750	679 10
6	Golden Tankard	17 1,200	586 40	22 1,100	751 40	20 150	669 10
7	Prize Mammoth Long Red	18 800	613 20	21 1,200	720 ..	20 ..	666 40
8	Improved Mammoth Saw-Log	16 1,000	550 ..	22 1,500	758 20	19 1,250	654 10
9	Gate Post	17 200	570 ..	21 1,800	730 ..	19 1,000	650 ..
10	Selected Yellow Globe	15 1,000	516 40	22	733 20	18 1,500	625 ..
11	Mammoth Yellow Intermediate	16 1,000	550 ..	19 1,000	650 ..	18 ..	600 ..
12	Sludstrup	13 1,800	463 20	21 1,800	730 ..	17 1,800	596 40
	Average	17 1,700	595 ..	23 950	782 30	20 1,325	688 45

LENNOXVILLE.

CARROTS.

Seven varieties of carrots were planted in check rows on May 25 in the same manner as described for swedes and mangels and were harvested on October 22.

CARROTS.—Test of Varieties.

No.	Variety.	1st Plot Yield per Acre.				2nd Plot Yield per Acre.				Average Yield per Acre.			
		Tons.	Lb.	Bush.	Lb.	Tons.	Lb.	Bush.	Lb.	Tons.	Lb.	Bush.	Lb.
1	White Belgian	19	300	638	20	19	800	646	40	19	550	642	30
2	Svalof Champion	18	1,450	624	10	19	400	640	.	18	1,925	632	5
3	Mammoth White Intermediate	18	750	612	30	19	400	640	..	18	1,575	626	15
4	Improved Short White	17	1,450	590	50	18	800	613	20	18	125	602	5
5	Ontario Champion	18	900	615	..	16	1,850	564	10	17	1,375	589	35
6	Champion	16	750	545	50	18	..	600	..	17	375	572	55
7	Giant White Vosges	11	1,900	398	20	15	1,200	520	..	13	1,550	459	10
	Average	17	500	575	..	18	207	603	27	17	1,354	589	14

SUGAR BEETS.

Three varieties of sugar beets were tested out in check rows in the same manner as described for swedes, mangels and carrots. The seed was planted on May 25, and the crop was harvested on October 20.

SUGAR BEETS.—Test of Varieties.

No.	Variety.	1st Plot Yield per Acre.				2nd Plot Yield per Acre.				Average Yield per Acre.			
		Tons.	Lb.	Bush.	Lb.	Tons.	Lb.	Bush.	Lb.	Tons.	Lb.	Bush.	Lb.
1	Klein Wanzleben	12	..	400	..	11	1,000	383	20	11	1,500	391	40
2	Improved Vilmorin "A"	12	1,000	416	40	11	900	381	40	11	1,950	399	10
3	Improved Vilmorin "B"	11	1,000	383	20	11	400	373	20	11	700	378	20
	Average	12	..	400	.	11	767	379	27	11	1,383	389	43

ROOT SEED PRODUCTION.

The first start in the growing of root seed at this Station was commenced last spring, when a small area of swede and mangel roots was planted. These roots were planted on May 28 on soil such as is prepared for the growing of field roots, in rows three feet apart and two feet apart in the row. These were cultivated regularly until cultivation interfered with the growth of seed stalks. It was found necessary to clip off the seed stalks which matured first, for if they were left until all matured a great part would shell and be lost. The yield from the swedes was 1,228 pounds per acre and mangels 1,157 pounds per acre. After harvesting this seed the mangel roots from which seed was produced were harvested and found to be very sound and weighed

practically double what they did when planted. They were stored and fed to live stock and seemed to be relished as well as the first year's growth.

Root seed growing is an industry which should be encouraged in every way possible in the Dominion and especially in the Eastern Townships. During the past year a couple of good demonstrations were held in the district on the advantage of home-grown seed over the commercial, the home-grown maturing better, yielding heavier tonnage per acre than the commercial seed, which no doubt came from European countries and was grown under conditions entirely different from those prevailing in this district.

GRASSES AND CLOVERS.

In the spring of 1915 there was set apart a small area on the highest and most exposed part of the Farm to test out different varieties of grasses and clovers. This piece of land was divided off into one eightieth acre plots, on which were sown the following: Timothy, Orchard Grass, Red Top, Kentucky Blue grass, Meadow fescue, Sheep's fescue, Western Rye grass, Perennial Rye grass, Grimm's alfalfa, Red clover, Alsike clover.

The soil was a clay loam and as it was not too well prepared the previous fall very good results were not looked for, but the different varieties planted came on very well.

Four plots of each variety were planted, two of which will be harvested for hay, so as to ascertain the yields of the same and the remaining two for seed production. The object of the duplicate plots is to be able to obtain more accurate results. All the varieties seemed to go into winter quarters in good condition with a good aftermath which is always preferable in a cold district as a winter protection for such plants.

A small area of Grim's alfalfa was planted in drills outside of the plots previously mentioned. The drills were about two feet apart so as to enable the cultivator to be run between them. The object of the experiment is to endeavour to secure some seed from plants grown under local conditions.

HAY CROP.

The small amount of snow on the fields in the winter of 1914-15 left the new-seeded clover badly exposed which caused a loss of quite a large percentage of this very important forage crop, but with the favourable weather for hay in the months of May and June with a precipitation of 3·78 inches scattered well through the months, a record crop of hay was harvested in the district of mostly timothy, with a small percentage of clover. In spite of this fact a few farmers in the district saved a small quantity of clover for seed purposes which was hulled by a Sawyer-Massey huller owned by the Sherbrooke County Agricultural Society.

These farmers were very enthusiastic over this industry and it is almost certain that there will be a large per cent of the farmers take advantage of this machine for it has been very conclusively demonstrated that seed grown under local conditions will withstand the severe weather conditions more favourably than seed grown in warmer localities, and with the high price of clover seed it is a very paying proposition for the farmer.

LENNOXVILLE.

EXPERIMENTAL FARM, BRANDON, MAN.

REPORT OF THE SUPERINTENDENT, W. C. McKILLICAN, B.S.A.

THE SEASON.

The season of 1915 was a most unfavourable one for fodder crops. The early part of the season was very dry, giving hay crops a very poor start. Then there was a long period of cold weather with several frosts which made the crop very backward. Very early and severe frosts, on August 23 and 25, killed the corn crop and prevented further growth. As a result of these untoward conditions, corn was less than half a crop, and hay was the lightest in years. Field roots were a good crop, having been planted in summer-fallowed land where a good store of moisture was available even though the rainfall was scant.

INDIAN CORN.

Sixteen varieties of Indian corn for fodder were tested this year. They were planted on May 21 on summer-fallowed land. The season was the most unfavourable for corn in many years and less than half a crop was harvested. These test rows, being on summer-fallowed land, fared rather better than the main fields, but were frozen on August 23, when still quite immature. The results obtained were as follows:—

INDIAN CORN.—Test of Varities.

No.	Variety.	Stage when Cut.	Average Height.		Yield per Acre	
			Ft.	In.	Tons.	Lb.
1	Gehu	Ears Forming	4	8	11	1,000
2	Compton's Early	Tassel only	4	8	10	1,020
3	Golden Glow	Silk	6	5	10	500
4	Early Longfellow	Ears Forming	4	10	9	1,870
5	Wisconsin No. 7	Tassel only	6	1	9	1,430
6	Longfellow	Tassel only	5	2	9	860
7	Free Press	Milk	3	6	9	560
8	Northwestern Dent	Ears forming	6	0	8	1,170
9	North Dakota White	Only Partly Tasselled	4	3	8	1,030
10	King Philip	Silk	5	9	8	1,100
11	Quebec Yellow	Ears forming	3	9	8	970
12	Minnesota No. 13	Silk	6	10	8	820
13	Minnesota No. 23	Ears Forming	4	10	8	240
14	August Dent	Ears Forming	6	0	7	1,270
15	Baily	Silk	6	9	7	510
16	Canada Yellow	Late Milk	3	0	7	340
		Average			8	1,925

Gehu, which has given the largest yield this year, is not usually a high yielder, but, being an early sort of low leafy growth, was less injured by the cold weather than the larger varieties. Northwestern Dent, Longfellow, North Dakota White, Golden Glow and Minnesota No. 13, are all well suited to fodder growing in Manitoba. Compton's Early yields well but is rather late for this climate.

AVERAGES.

Six of these varieties have been grown for five years and three others for three or four year periods, with the following results:—

Variety.	Average Condition When Cut.	Average Yield per Acre.	
		Tons.	Lb.
Compton's Early (average of 5 years)	Ears Beginning to Form	17	1,332
North Dakota White (average of 5 years)	Milk Stage	15	1,376
Northwestern Dent (average of 5 years)	Milk to Dough Stage	15	1,253
Longfellow (average of 5 years)	Ears forming to Milk Stage	15	1,193
Quebec Yellow (average of 5 years)	Dough Stage	13	974
Gehu (average of 5 years)	Dough Stage	12	1,632
Free Press (average of 4 years)	Firm Dough to Ripe	9	1,872
Minnesota No. 13 (average of 3 years)	Milk Stage	11	1,517
Early Longfellow (average of 3 years)	Milk to Dough Stage	11	1,019

HOME-GROWN SEED CORN.

The unusually hot season of 1914 made possible the ripening of good seed of a number of varieties that do not usually ripen in this climate. This year a test was made to compare the value of this home-grown seed with the usual imported stocks. These tests were conducted under the same conditions as described for the variety tests. The results obtained were as follows:—

Variety.	Stage When Cut.	Yield per Acre.	
		Tons.	Lb.
Longfellow (home-grown seed)	Silk	11	264
Longfellow (purchased seed)	Tassel Only	9	860
Northwestern Dent (home-grown seed)	Milk	10	1,480
Northwestern Dent (purchased seed)	Ears Forming	8	1,173
Minnesota No. 13 (home-grown seed)	Ears Forming	9	1,942
Minnesota No. 13 (purchased seed)	Silk	8	824
Quebec Yellow (home-grown seed)	Ears Forming	9	1,665
Quebec Yellow (purchased seed)	Ears Forming	8	974
Average of 4 Varieties (home-grown seed)		10	838
Average of 4 Varieties (purchased seed)		8	958

Every variety produced a higher yield from the home-grown seed with an average increase of almost 2 tons per acre. Three out of the four varieties were earlier when home-grown seed was used. This test would indicate that when seasons permit of the ripening of corn it pays to gather and save any ripe seed that can be got. It must, however, be fully developed and hardened before it is fit to save for seed.

BRANDON.

TURNIPS.

Eighteen varieties of turnips were tested this year. They were sown on May 10 on heavy clay land which had been summer-fallowed the previous year. Only swede varieties were used, as the other kinds have not given satisfactory results in past years. The results obtained were as follows:—

TURNIPS.—Test of Varieties.

No.	Variety.	1st Plot Yield per acre.		2nd Plot Yield per acre.		Average Yield per acre.	
		Tons.	Lb.	Tons.	Lb.	Tons.	Lb.
1	Empress	24	750	22	590	23	670
2	Carter's Imperial	26	650	19	610	22	1,630
3	Invicta	23	1,450	20	560	22	5
4	Durham	22	590	21	1,030	21	1,810
5	Prize Purple Top	25	670	19	1,650	21	1,160
6	Jumbo	23	1,060	18	750	20	1,905
7	Magnum Bonum	21	250	20	950	20	1,600
8	Kangaroo	20	690	20	1,340	20	1,015
9	Hazard's Improved	19	1,000	21	250	20	625
10	Hall's Westbury	21	900	18	1,310	20	105
11	Halewoods' Bronze Top	21	1,680	16	1,670	19	675
12	Canadian Gem	19	1,910	18	530	19	200
13	Skirving's	19	1,910	17	1,750	18	1,830
14	Perfection Purple Top	20	1,860	15	1,850	18	855
15	Mammoth Clyde	16	809	18	1,700	17	1,295
16	New Century	16	1,410	18	790	17	1,100
17	Good Luck	18	1,850	14	1,900	16	1,475
18	Corning's Lapland	18	1,310	14	1,250	16	1,280
	Average	21	113	18	1,582	19	1,847

AVERAGE YIELDS.

Five of these varieties have been grown for five years or more, three for four years and six for three years, with the following average results:—

Variety.	Average Yield per acre.	
	Tons.	Lb.
Hall's Westbury (average of 5 years)	23	1,936
Perfection Purple Top (average of 5 years)	23	1,126
Halewood's Bronze Top (average of 5 years)	23	266
Magnum Bonum (average of 5 years)	23	123
Good Luck (average of 5 years)	21	591
Canadian Gem (average of 4 years)	23	841
Carter's Imperial (average of 4 years)	22	1,112
Hazard's Improved (average of 4 years)	21	520
Prize Purple Top (average of 3 years)	24	1,993
Mammoth Clyde (average of 3 years)	22	800
Invicta (average of 3 years)	20	755
Jumbo (average of 3 years)	19	152
New Century (average of 3 years)	18	1,522
Lapland (average of 3 years)	17	1,775

The variations in yield among these varieties are so small, and the order of productiveness varies so much from year to year that it is impossible to say that any one variety is better than the others. Almost any of the varieties now under test may be grown with good prospects of success.

BRANDON.

MANGELS.

Eighteen varieties of mangels and feeding sugar beets were tested this year. They were sown on May 10 on heavy clay land, summer-fallowed. The results obtained were as follows:—

MANGELS.—Test of Varieties.

No.	Variety.	1st Plot Yield per acre.		2nd Plot Yield per acre.		Average Yield per acre.	
		Tons.	Lb.	Tons.	Lb.	Tons.	Lb.
1	Giant Yellow Intermediate	27	950	25	1,620	26	1,285
2	Giant Yellow Globe	23	1,180	28	1,500	26	340
3	Peerless	23	1,400	17	1,610	25	1,505
4	Yellow Eckendorfer	23	70	26	610	24	1,340
5	Mammoth Yellow Intermediate	21	1,290	26	1,950	24	620
6	Danish Sludstrup	22	400	25	1,650	24	25
7	Yellow Leviathan	23	1,180	23	1,400	23	1,290
8	Selected Yellow Globe	26	730	20	1,630	23	1,180
9	Gate Post	23	70	23	620	23	345
10	Monarch Sugar Beet	22	960	23	1,180	23	70
11	Prize Mammoth Long Red	22	960	23	1,180	22	1,795
12	Perfection Mammoth Long Red	21	1,850	23	1,180	22	1,515
13	Mammoth Long Red	22	1,510	22	400	22	955
14	Leviathan Sugar Beet	20	1,630	24	60	22	845
15	Improved Mammoth Saw-Log	19	1,960	23	1,180	21	1,570
16	Royal Giant Sugar Beet	21	1,80	20	1,630	20	1,905
17	Giant Half Sugar White	20	420	20	1,630	20	1,025
18	Golden Tankard	18	850	21	180	19	1,515
	Average	22	725	24	289	23	507

The eight highest yielding varieties this year are all yellow in colour and short or medium in length. However, when the yields for several years are considered, no one variety or type has any outstanding advantage. It is therefore difficult to make any recommendations from a standpoint of yield. When the form of the mangels is considered, however, there are found good grounds for choice. The mammoth long red varieties are long and deeply fixed in the ground and bear many rootlets. They are consequently hard to pull, and if the soil is at all tenacious, much clings to them. The yellow varieties are much shorter, grow chiefly above the ground and, as a result, are easily pulled and are practically free from dirt. The sugar beet varieties included in this test are long but stand much higher out of the ground than the mammoth long reds, and have their rootlets at the tip. They are consequently easy to pull and comparatively free from dirt.

BRANDON.

AVERAGE YIELDS.

Eight of these varieties have been grown for five years, and two others for three years. The following average yields have been obtained in those periods:—

Variety.	Average Yield per acre.	
	Tons.	Lb.
Prize Mammoth Long Red	32	884
Giant Yellow Globe	31	629
Giant Yellow Intermediate	30	665
Gate Post	29	1,384
Perfection Mammoth Long Red	29	1,322
Selected Yellow Globe	28	500
Giant Half Sugar White	27	759
Golden Tankard	23	441
Danish Sludstrup (average of 3 years)	28	239
Yellow Leviathan (average of 3 years)	27	1,433

FIELD CARROTS.

Five varieties of field carrots were tested this year under similar conditions to those under which the other field roots were grown. The results were as follows:—

CARROTS.—Test of Varieties.

No.	Variety.	Yield per acre 1915.		Average Yield per acre for 3 to 5 years.	
		Tons.	Lb.	Tons.	Lb.
1	White Belgian	17	1,760	14	111 (5 yr.av.)
2	Mammoth White Intermediate	17	1,200	14	1,744 (4 "
3	Giant White Vosges	17	240	10	1,321 (3 "
4	Ontario Champion	16	1,280	15	1,215 (3 "
5	Improved Short White	16	500	13	1,348 (5 "
	Average	17	196		

SUGAR BEETS.

Three varieties of true sugar beets suitable for sugar production were tested this year. They were sown under the same conditions as described for mangels and turnips. The results obtained this year and the average yield for the past five years are as follows:—

SUGAR BEETS.—Test of Varieties.

No.	Variety.	Yield per 1915.		Percentage of Sugar In juice.	Average Yield per acre for 5 years.	
		Tons.	Lb.		Tons.	Lb.
1	Vilmorin's Improved "B"	16	750	15·9	16	1,332
2	Vilmorin's Improved "A"	14	1,970	17·3	15	1,826
3	Klein Wanzleben	12	1,530	14·5	16	758
	Average	14	1,417			

BRANDON.

GRASSES, CLOVERS AND ALFALFA.

Thirteen kinds of grasses, clovers and alfalfa were tested in uniform duplicate test plots. Also twelve mixtures of the same crops were tested under the same conditions. These plots were sown in 1914 on land that was summer-fallowed the previous year. They were sown without any nurse crop. The winter was a hard one on red clover and alsike. They were both partly winter-killed and considerably thinned out. The other crops all wintered successfully. The yields obtained in 1915 were as follows:—

GRASSES, Clovers and Alfalfa.

Variety.	Yield per Acre 1st Cutting.		Yield per Acre 2nd Cutting.		Total per Acre.	
	Tons.	Lb.	Tons.	Lb.	Tons.	Lb.
Baltic Alfalfa	2	1,340	2	860	5	200
Grimm's Alfalfa	2	800	2	1,320	5	120
Turkestan Alfalfa	2	1,400	1,	1,800	4	1,200
Common Alfalfa	2	540	1,	1,100	3	1,640
Montana Alfalfa	1	1,520	1,	1,140	3	660
Western Rye grass	3	620			3	620
Brome grass	2	1,800			2	1,800
Timothy	2	900			2	900
Kentucky Blue grass	1	500			1	500
Red Top	1	160			1	160
Red clover	..	1,900			..	1,900
Alsike clover	..	1,380			..	1,380
Orchard grass	..	600			..	600

As in previous years, alfalfa has again proved itself to be the most productive hay crop. Baltic alfalfa which has given the largest yield this year, is a strain originated in South Dakota. It is variegated in bloom and is very much like Grimm's alfalfa. It seems to be a very hardy and desirable strain. Grimm's and Turkestan have been grown for years and are known to be hardy and reliable. Common alfalfa, both of the ordinary stock and Montana seed, was thinned out by winter-killing to some extent and consequently did not give quite as high a yield as the hardier strains.

Western rye grass shows its productiveness; everything being considered this is the most desirable grass for western hay production that has brought into use up to the present.

BRANDON.

Mixtures.	Notes on Mixture.	Yield per acre First Cutting.	Yield per acre Second Cutting.	Yield per acre. Total Crop.
		Tons. Lb.	Tons. Lb.	Tons. Lb.
Timothy and Alfalfa	Alfalfa predominates, good thick stand	3 320	1 1,280	4 1,600
Western Rye grass and Alfalfa	Well proportioned and thick	3 280	1 1,060	4 1,340
Timothy, Western Rye grass and Alfalfa	Well mixed, with alfalfa predominating somewhat	2 1,700	1 880	4 580
Timothy, Western Rye grass, Red clover and Alfalfa	Red clover gone, others evenly mixed	2 1,500	1 760	4 260
Western Rye grass, Red clover and Alfalfa	Red clover gone, other evenly mixed	2 1,340	1 720	4 60
Timothy, Red clover and Alfalfa	Red clover gone, alfalfa predominating	2 1,380	1 606	4 40
Western Rye grass and Alsike	Only a little Alsike left	3 100	.....	3 100
Western Rye grass and Red clover	Only a little Red clover left	2 1,860	.....	2 1,860
Timothy and Red clover	Mostly Timothy	2 720	.....	2 720
Timothy, Western Rye grass and Alsike	Alsike nearly gone, mostly Western Rye grass	2 720	.....	2 720
Timothy, Western Rye grass and Red clover	Well mixed with Western rye grass predominating	2 680	.....	2 680
Timothy and Alsike	Mostly Timothy	2 400	.....	2 400

FOUR-YEAR AVERAGES.

Several of these hay crops and mixtures have been grown for four consecutive years; the following are the average yields for that time:—

Crop or Mixture.	Average Yield per Acre for Four Years.
	Tons. Lb.
Turkestan Alfalfa	4 1,498
Grimm's Alfalfa	4 1,180
Montana Alfalfa	4 1,165
Western Rye grass	3 245
Brome grass	3 195
Timothy	2 335
Red Top	1 530
Kentucky Blue grass	0 1,845
Timothy, Western Rye grass, Red clover and Alfalfa	4 1,110
Western Rye grass and Alfalfa	4 390
Timothy and Alfalfa	3 1,600
Western Rye grass and Red clover	3 575
Timothy, Western Rye grass and Red clover	3 220
Timothy and Red clover	2 1,755

ALFALFA FOR SEED PRODUCTION.

In 1914 about three acres of light sandy land was sown to alfalfa in rows for seed production. Different varieties and strains were used and different rates of seed per acre were tried. This year half the field was clipped off about the middle of June and a light crop of hay taken off; the remainder was left uncut. Neither piece produced any crop of seed worth harvesting. Possibly this was due to the unfavourable season. The test will be continued in the future to see if it is possible to grow alfalfa seed in profitable quantities in Manitoba.

ANNUAL HAY CROPS.

The tests with annual hay crops that have been conducted during the previous two years were continued in 1915. The plots were sown on May 14 on summer-fallowed land. The results obtained were as follows:—

Name of Crop.	Quality of Hay.	Date Ready to Cut.	Height.	Yield per Acre (1915).	Yield per Acre Average of 3 years.
			Inches.	Tons. Lb.	Tons. Lb.
Oats	Medium coarse	Aug. 16	52	6 1,800	5 287
Oats and Hairy Vetch	" "	" 16	52	6 1,280	
Oats and Common Vetch	" "	" 16	52	6 480	
Oats and Peas	" "	" 16	52	6 360	4 1,193
Hungarian Millet	" "	" 23	41	6 420	4 400
Siberian Millet	" "	" 23	45	6 840	4 343
Common Millet	Fairly fine	" 16	32	4 440	2 1,493
Spring Rye	Coarse	July 20	54	5 580	3 1,427
Beardless Barley	Medium coarse	" 25	48	4 00	
Common Vetch	" "	" 29	30	3 260	
Hairy Vetch	" "	Aug. 11	42	2 480	
Sweet Clover	" "	" 16	13	1 1,380	
Sudan Grass	Coarse	" 23	32	1 780	

The mixtures of oats with Common and Hairy vetch did not prove satisfactory. The oats crowded the vetches out completely, so that the crop was practically pure oats, and the vetch seed (half a bushel per acre) was wasted. The oat hay was not as good quality as usual this year, being very rank and lodged, and somewhat rusty. The millet hay was relished more by the cattle this year; last year the opposite was true. The yield of sweet clover is hardly indicative of its yielding power, as being a biennial it would yield more heavily in the second year. The sweet clover hay was eaten this year by all the cattle used in the test except one. It was cut very early, when only 13 inches high, and cured very well. Handled this way, it appears to have a good value. Sudan grass was tried for the first time, with very unsatisfactory results. While it would doubtless do better in a warmer season, it is not probable that our summer is ever warm enough for this crop to do well.

BRANDON.

EXPERIMENTAL FARM, INDIAN HEAD, SASK.

REPORT OF THE SUPERINTENDENT, W. H. GIBSON, B.S.A.

SEASONAL NOTES.

The season of 1915 opened comparatively early, but the absence of moisture in the early part of the year was somewhat detrimental to best results in forage crops and as a result hay and alfalfa gave very poor yields.

The root crop suffered considerably in the early part of the year. However, the rain later in the season brought them along in good shape, and a fair average crop was harvested.

Early-sown corn suffered as a result of the late spring frosts, while the later sown corn came through unscathed, and, as a consequence, gave higher yields. Corn should not be planted much before May 24.

INDIAN CORN FOR ENSILAGE.

Fourteen varieties were tested on summer-fallow. The land received a top dressing of manure the previous fall. They were sown on May 28 and harvested September 14.

INDIAN CORN FOR ENSILAGE.—Test of Varieties.

No.	Variety.	Date Sown.	Date Harvested.	Average Height.	Yield per Acre.	
				Inches.	Tons.	Lb.
1	Golden Glow	May 28	Sept. 14	69	17	700
2	Early Longfellow	" 28	" 14	68	16	1,700
3	Wisconsin No. 7	" 28	" 14	64	16	1,600
4	Salzer's North Dakota	" 28	" 14	65	16	1,000
5	King Philip	" 28	" 14	61	15	300
6	Compton's Early	" 28	" 14	61	14	1,700
7	Bailey	" 28	" 14	65	14	200
8	North Western Dent	" 28	" 14	64	13	1,800
9	White Cap Yellow Dent	" 28	" 14	69	12	1,400
10	Free Press	" 28	" 14	55	12	1,200
11	August Dent	" 28	" 14	59	12	800
12	Gehu	" 28	" 14	50	12	300
13	Canada Yellow	" 28	" 14	59	11	1,000
14	Quebec Yellow	" 28	" 14	57	11	.....
	Average				14	264

CORN FOR ENSILAGE—FIELD LOTS.

Experiments at Indian Head demonstrate clearly that corn can be grown quite successfully in southern Saskatchewan. It is one of the best crops grown in rotation. It acts as a cleaning crop to the land and furnishes ample forage for live stock. Corn makes a splendid soiling crop. It can be cut green and used as a supplement to pasture. When converted into silage it serves to supply succulence during the winter months.

CORN for Ensilage.—Field tests.

Variety.	Area.	Yield per Acre.	
		Tons.	Lb.
Minnesota No. 13	5.75	9	1,360
North Western Dent	6	8	1,650
North Western Dent	5.50	6	830
Average	.....	8	613

TURNIPS.

Twenty-three varieties of turnips were tested on well-prepared summer-fallow. These were sown May 26 and harvested October 15.

TURNIPS.—Test of Varieties.

No.	Variety.	Date Sown.	Date Harvested.	Yield per Acre.			
				Tons.	Lb.	Bush.	Lb.
1	Perfection	May 26	Oct. 15	19	500	641	40
2	Canadian Gem	" 26	" 15	18	1,400	623	20
3	Jumbo	" 26	" 15	18	1,350	622	30
4	Halewood's Bronze Top	" 26	" 15	18	950	615	50
5	Hazard's Improved	" 26	" 15	18	850	614	10
6	Invicta	" 26	" 15	18	700	611	40
7	Hall's Westbury	" 26	" 15	18	550	609	10
8	Skirving's	" 26	" 15	18	550	609	10
9	Mammoth Clyde	" 26	" 15	18	250	604	10
10	Kangaroo	" 26	" 15	18	100	601	40
11	Magnum Bonum	" 26	" 15	17	600	576	40
12	White Globe	" 26	" 15	17	600	576	40
13	Empress	" 26	" 15	17	400	573	00
14	Durham	" 26	" 15	17	100	568	20
15	Good Luck	" 26	" 15	16	1,800	563	20
16	New Century	" 26	" 15	16	1,,00	556	40
17	Carter's Imperial	" 26	" 15	16	1,300	555	00
18	Corning's Lapland	" 26	" 15	16	1,100	551	40
19	Prize Purple Top	" 26	" 15	16	350	539	10
20	Mammoth Grey Stone	" 26	" 15	15	1,050	517	30
21	Hartley's Bronze Top	" 26	" 15	15	850	514	10
22	Yellow Aberdeen Purple Top	" 26	" 15	13	1,550	459	10
23	Yellow Aberdeen Green Top	" 26	" 15	12	400	406	40
	Average	.....	.....	17	204	570	4

MANGELS.

Fourteen varieties of mangels were tested on well prepared fallow land. These were sown May 13 and harvested October 14.

MANGELS.—Test of Varities.

No.	Variety.	Date Sown.	Date Harvested.	Yield per Acre.			
				Tons.	Lb.	Bush.	Lb.
1	Giant Yellow Glove	May 13	Oct. 14	15	300	505	00
2	Danish Sludstrup	" 13	" 14	14	1,900	498	20
3	Wibolt's Short Ovoid Giant	" 13	" 14	14	1,800	496	40
4	Gate Post	" 13	" 14	14	1,350	489	10
5	Prize Mammoth Long Red	" 13	" 14	14	900	481	40
6	Perfection Mammoth Long Red	" 13	" 14	13	1,900	465	00
7	Mammoth Long Red	" 13	" 14	13	1,150	452	30
8	Giant Yellow Intermediate	" 13	" 14	13	650	444	10
9	Yellow Leviathan	" 13	" 14	13	300	438	20
10	Improved Mammoth Saw-Log	" 13	" 14	13	250	437	30
11	Giant Half Sugar White	" 13	" 14	12	1,400	423	20
12	Wibolt's Long Ovoid Giant	" 13	" 14	12	1,200	420	00
13	Selected Yellow Globe	" 13	" 14	12	550	409	10
14	Golden Tankard	" 13	" 14	10	1,450	357	30
	Average			13	1,079	451	19

CARROTS.

Five varieties of field carrots were tested. These were sown April 29, and harvested October 21.

CARROTS.—Test of Varieties.

No.	Variety.	Date Sown.	Date Harvested.	Yield per Acre.			
				Tons.	Lb.	Bush.	Lb.
1	Ontario Champion	April 28	Oct. 21	17	1,350	589	10
2	White Belgian	" 28	" 21	15	1,350	522	30
3	Giant White Vosges	" 28	" 21	14	1,700	495	00
4	Mammoth White Intermediate	" 28	" 21	11	1,750	395	50
5	Improved Short White	" 28	" 21	10	1,050	350	50
	Average			14	240	470	40

SUGAR BEETS.

Three varieties of sugar beets were tested on well prepared fallow. They were sown May 13 and harvested October 21.

SUGAR BEETS.—Test of Varieties.

No.	Variety.	Date Sown.	Date Harvested.	Yield per Acre.	
				Tons. Lb.	Bush. Lb.
1	Klein Wanzleben	May 13	Oct. 21	9 850	314 10
2	Vilmorin Improved (A)	" 13	" 21	9 600	310 00
3	Vilmorin Improved (B)	" 13	" 21	8 1,400	290 00
	Average			9 283	304 43

GRASSES, CLOVERS AND ALFALFA.

GRASSES.

With the advent of mixed farming and a wider use of forage crops, the grasses suitable to prairie conditions are receiving consideration. In discussing the question of grasses, it is impossible to lay down any hard and fast rule that will be applicable to all conditions. The most suitable grasses for southern Saskatchewan are Western Rye, Timothy, Meadow Fescue, Brome grass and Red Top. Of these Brome grass and Western Rye are best adapted to a wide range of conditions.

CLOVERS.

The clovers are not quite as hardy and do not withstand the severe winter conditions as well as alfalfa. However, for short rotations they are better suited than alfalfa.

ALFALFA.

Alfalfa has passed the experimental stage. It is well adapted to the climatic conditions of southern Saskatchewan and should be included in almost every hay and pasture mixture. It is hardy and has the ability to withstand the hard winters and produce large crops of forage.

INDIAN HEAD.

EXPERIMENTAL STATION, ROSTHERN, SASK.

REPORT OF THE SUPERINTENDENT, W. A. MUNRO, B.A., B.S.A.

THE SEASON.

The season of 1915 was decidedly unfavourable for forage crops, and particularly for hay and corn. There was slightly more than half as much moisture from April to September as for an average of the four previous years. This, coupled with a severe frost on the 12th of June, and another later in August completely destroyed the corn and produced almost no hay from the cultivated grasses. The root crops fared better, although the yield in these was far below the average.

MANGELS.

The germination of all the mangel seed has been poor for the past two years. There were six varieties tried out this season which yielded upwards of 12 tons per acre computed from the yield of two rows 30 inches apart and 78 feet long, viz., Mammoth Long, Red, Danish Sludstrup, Improved Mammoth Saw-Log, Gate Post, Giant Half Sugar White, and Giant Yellow Globe.

TURNIPS.

Twenty-six varieties of turnips were under test and the seven highest yielders were as follows:—

Mammoth Greystone	14	tons	1,150	lb. per acre.
Carter's Imperial	12	"	1,020	"
Kangaroo	11	"	1,900	"
Jumbo	11	"	340	"
Invicta	10	"	1,670	"
Skirving's	10	"	1,000	"
Hall's Westbury	10	"	780	"

Hall's Westbury, on account of its quality and high average yield, is recommended above any of the other varieties. It is of splendid quality for culinary purposes.

CARROTS.

Five varieties of field carrots were grown with the following results:—

White Belgian	3	tons	1,430	lb. per acre.
Ontario Champion	3	"	870	"
Giant White Vosges	3	"	530	"
Mammoth White Intermediate	2	"	410	"
Improved Short White	1	"	1,520	"

SUGAR BEETS.

Following is the yield of three varieties of sugar beets:—

Vilmorin Improved A	5	tons	1,560	lb. per acre.
Klein Wanzleben	4	"	1,450	"
Vilmorin Improved B	3	"	310	"

EXPERIMENTAL STATION, SCOTT, SASK.

REPORT OF THE ACTING SUPERINTENDENT, M. J. TINLING, B.S.A.

WEATHER CONDITIONS.

The season of 1915, while favourable to the production of good crops of hay, has not been so satisfactory for fodder corn and field roots.

The spring opened in seasonable time, with normal weather conditions during April. May, June, and July were cooler than usual, with frosts on June 7, 14, and 16 that froze the leaves of the young corn plants, and checked the growth of the field roots. Commencing with August 3, warm, dry weather was experienced. Rainfall was recorded on seventeen days between July 15 and October 25, but with only a total precipitation of 2·5 inches.

From the 9th to the 15th of September sharp frosts occurred, commencing with 5 degrees of frost on the 9th, and culminating with 23 degrees on the 15th. The corn was harvested on September 4, and thus escaped injury. The mangel crop was rendered useless for feeding or for making comparative tests. Parts of the leaves of the turnips, carrots, and sugar beets was destroyed, thus checking any further growth.

VARIETY TESTS.

Experimental work with forage crops has consisted in testing out varieties of fodder corn, field roots, grasses, and annual hay crops. Some additional work with red clover and alfalfa has also been started.

INDIAN CORN AND FIELD ROOTS.

PREPARATION OF THE SOIL.

The soil, on which the corn and roots were grown, was a dark chocolate clay loam, with a clay subsoil. Early in the spring, well rotted barnyard manure was spread on the field at the rate of 10 tons per acre; the field was then ploughed 9 inches deep, floated, packed, and harrowed. Previous to sowing the roots, on May 11, the ground was again harrowed with the smoothing harrow. The ordinary double disc grain drill was used in sowing; the rows were 2½ feet apart for the roots, and 3½ feet for the corn. Germination was uniform, but some loss of young corn and mangel plants were experienced from wire worms.

All tests with corn and roots were conducted in duplicate. The results given in the following tables are the averages from the two tests made with each variety:—

INDIAN CORN.

Thirteen varieties of corn were tested out for fodder production. The corn was planted on May 15, and harvested September 4.

The yields given in the following are the weights of the corn at time of harvesting:—

INDIAN CORN.—Test of Varieties.

No.	Variety.	Average Height.	Stage of Maturity.	Average Yield per Acre.	
		Inches.		Tons.	Lb.
1	Gehu	57	Early Silk	10	1,290
2	Early Longfellow	63	Tassel	9	1,480
3	King Philip	61½	Tassel	9	1,400
4	Bailey	61	Tassel	8	1,860
5	Free Press	56	Silk	8	1,840
6	Golden Glow	63	Tassel	8	1,700
7	Salzer's North Dakota	60	Tassel	8	1,420
8	Compton's Early	61½	Tassel	8	1,120
9	Quebec Yellow	56½	Late Silk	7	1,840
10	Canada Yellow	53	Silk	7	1,760
11	Wisconsin No. 7	63	Tassel	7	1,450
12	White Cap Yellow Dent	62	Tassel	6	1,720
13	North Western Dent	60	Early Silk	6	1,070
	Average			8	1,077

In the production of fodder corn in northwestern Saskatchewan, three important points are to be considered: (1) Selection of early maturing varieties; (2) sowing on soil that is reasonably moist and well enriched with barnyard manure; (3) frequent tillage throughout the season.

Notes taken at the time of harvesting showed that the fodder from the early maturing varieties, such as the Quebec Yellow, Free Press, and Gehu, was of considerably higher feeding value than that from the late maturing kinds, the stalks of which were very soft and watery.

TURNIPS.

Twenty-six varieties of turnips were sown on May 11, in rows 2½ feet apart. In thinning the plants were left 12 inches apart. The crop was harvested on October 16. The following table gives the total yields per acre:—

TURNIPS.—Test of Varieties.

No.	Variety.	Description.	Total Yield per Acre.			
			Tons.	Lb.	Bush.	Lb.
1	Cow Horn	Large, long	17	980	583	00
2	Mammoth Greystone	Round	15	1,350	522	30
3	Carter's Imperial	Small, round, smooth	15	390	506	30
4	Hartley's Bronze Top	Small, round	15	30	500	30
5	Perfection	Large, smooth	14	1,370	489	30
6	Empress	Large, round	14	1,240	487	20
7	Invicta	Large, rough	14	760	479	20
8	Halewood's Bronze Top	Small, rooty	13	1,980	466	20
9	Hazard's Improved	Round	13	1,390	456	30
10	Green Top	Small, rough	13	1,060	451	00
11	Yellow Aberdeen (Purple Top)	Large, some hollow	13	990	449	50
12	Prize Purple Top	Med. large, smooth	13	730	445	30
13	White Globe	A number decayed	13	270	437	50
14	Yellow Aberdeen (Green Top)	Round	12	750	412	30
15	Kangaroo	Small, rooty	12	750	412	30
16	Hall's Westbury	Large, smooth	12	90	401	30
17	Skirving's	Large, smooth	11	1,430	390	30
18	Jumbo	Small, rooty	11	1,430	390	30
19	Corning's Lapland	Small, oval	11	370	372	50
20	Canadian Gem	Rooty	11	110	368	30
21	New Century	Med. large, smooth	10	1,850	364	10
22	Magnum Bonum	Small, rough	10	790	346	30
23	Good Luck	Small, rooty	10	790	346	30
24	Mammoth Clyde	Round, smooth	10	130	335	30
25	Durham	Med. large, smooth	9	1,800	330	00
26	White Swede	Small, rough, very rooty	7	720	245	20
	Average		12	1,367	422	47

The two heaviest yielding varieties are not to be particularly recommended. The Cow Horn is a long turnip, difficult to handle in harvesting and in sorting. A considerable number of the Greystone variety were hollow, and some were partly decayed at the time of pulling.

Four varieties, Empress, Kangaroo, Skirving's, and Durham were grown on this Station for the first time. The Empress was sixth in point of yield and was of good quality.

SCOTT.

CARROTS.

Five varieties of field carrots were under test. The seed was sown on May 11 and the crop harvested on October 15. The rows were 2½ feet apart, and in thinning, the plants were left 6 inches apart in the rows. The yield per acre is given in the following table:—

CARROTS.—Test of Varieties.

No.	Variety.	Description.	Total Yield per Acre.			
			Tons.	Lb.	Bush.	Lb.
1	Ontario Champion	Long, smooth	6	140	202	20
2	White Belgian	Large, long	5	1,550	192	30
3	Giant White Vosges	Medium, small	5	360	172	40
4	Improved Short White	Large, smooth	4	1,310	155	10
5	Mammoth White Intermediate	Long, smooth	4	910	148	30

SUGAR BEETS.

Three varieties of sugar beets were grown. The seed was sown on May 11 and the corn harvested on October 14. The rows were 2½ feet apart, and the beets thinned to 12 inches apart in the rows.

Chemical tests made with sugar beets grown on this Station in 1914, indicated only a medium percentage of sugar content.

The following table gives the yields for 1915:—

SUGAR BEETS.—Test of Varieties.

No.	Variety.	Total Yield per Acre.			
		Tons.	Lb.	Bush.	Lb.
1	Vilmorin Improved (A)	13	1,390	456	30
2	Vilmorin Improved (B)	13	1,260	454	20
3	Klein Wanzleben	13	860	447	40
	Average	13	1,170	452	50

GRASSES AND CLOVER.

Five varieties of grasses and one of alsike clover were sown on uniform test plots in 1914. During the past year half of each of these plots was harvested for hay. The grass on the remaining portion of each plot was allowed to ripen and was threshed. The following table gives the yields of hay and grass seed secured:—

Variety.	Cut for Hay.			Cut for Seed.		
	Date of Cutting.	Yield per Acre.		Date of Cutting.	Height.	Yield of seed per Acre.
		Tons.	Lb.		Inches.	Lb.
Timothy	July 22	3	1,400	Aug. 13	34	700
Western Rye grass	" 22	2	1,500	" 13	44	1,550
Meadow fescue	" 22	2	1,500	" 13	32	450
Red Top	" 22	2	....	" 13	26	350
Kentucky Blue grass	" 22	1	900	" 13	23	175
Alsike clover	" 22	..	700	" 13	..	00

SCOTT.

The growth of Alsike clover was very weak, the yellowness of the leaves indicating an absence of nodule forming bacteria. The alsike seed failed to mature before the September frosts.

Meadow fescue, which was under test for the first time, yielded equally as much hay as Western Rye grass. The latter produced more seed, due to the Meadow fescue seed shelling out badly in harvesting.

Two plots, one-twelfth acre in area, were sown to Timothy and Brome grass in 1914. The quantity of Timothy seed used was in excess of the usual amounts, while the Brome grass was somewhat thin, due to the failure of some of the seed to germinate. The crop was cut on July 21, and gave the following yields per acre:—

Variety.	Date of Cutting.	Yield per Acre.	
		Tons.	Lb.
Timothy	July 21	4	40
Brome grass	" 21	2	1,400

ALFALFA.

An experiment to determine the best method of introducing nodule forming bacteria into the soil was started in 1913. Four plots were sown side by side on summer-fallowed land. Soil secured from an alfalfa field on the Indian Head Experimental Farm was spread on two of the plots, and harrowed in with a smoothing harrow. A third plot was not inoculated, while the seed on the fourth plot was treated with a culture received from the Ontario Agricultural College, Guelph, Ont.

The yields given in the following table are an average of those secured during the past two seasons from one cutting each year:—

Number of Plot.	Variety.	Method of Inoculation.	Average Yield per Acre 2 years.
			Lb.
1	Turkestan	Soil From Indian Head	2,261
2	Grimm's	Soil from Indian Head	2,338
3	Grimm's	No inoculation	1,737
4	Grimm's	Culture from O. A. C.	2,477

The yields of alfalfa have been light, due, in part, to using too much seed, and, in part, to dry climate conditions. While very heavy yields are not to be expected in this district, yet alfalfa will prove a profitable crop on the average farm for furnishing hay for young stock.

Careful attention to details will ensure a catch of alfalfa. Important points to be observed are having a fine, compact and reasonably moist seed bed, sowing early in the season, and using northern grown seed in less quantities than the amounts usually recommended. The importance of inoculation and taking only one crop of hay each year cannot be too strongly emphasized.

In order to determine the best methods of sowing alfalfa for hay and seed, Grimm's alfalfa was sown with the ordinary grain drill in rows 6, 8, 24 inches apart. The wider spacing between the rows permitted intertillage.

SCOTT.

RED CLOVER.

The experiments with strains of Red clover, commenced in 1913, have been continued. Small quantities of seed harvested in 1914 were sown in rows in the test plots. A fairly uniform germination was secured. The object of the experiment is not only to secure a hardy strain of red clover, but to obtain, if possible, a perennial type.

ANNUAL HAY CROPS.

Six kinds of annual forage crops were sown on May 18 on the uniform test plots. Two cuttings were secured from the spring rye plots, the first cutting being made on July 23. The yields given in the succeeding table are averages of two tests made with each kind:—

Kind of Crop	Yield per Acre.		Remarks.
	Tons	Lb.	
Spring rye	3	1,520	Hay stiff, with very little leaf.
Oats	3	1,000	Makes very satisfactory hay.
Oats and Peas	3	800	Excellent for hay.
Siberian millet	2	1,900	More leafy than other kinds.
Early Fortune millet	1	1,240	Too coarse for hay.
Crimson clover	1	860	Unsatisfactory yield.

The millets, owing to the cool weather experienced during the early part of the summer, did not make a satisfactory growth. Oats, and oats and peas make a more palatable fodder than spring rye.

YIELDS OF HAY GROWN UNDER FIELD CONDITIONS, 1912-15.

Commencing with 1911, three fields have been sown each season, with a mixture of Western Rye grass, Red clover and Alfalfa. The seed was sown with a nurse crop, and used at the rate of 10 pounds of the grass seed, and 3 pounds each of clover and alfalfa. Crops of hay were harvested the year following seeding down, and the fields pastured the succeeding season.

The following table gives the yields of hay secured during the past four years from the twelve fields under test:—

AVERAGE yields of Hay, 1912-15.

Rotation.	Average Yield per Acre.				Average Yield per Acre. 4 Years.
	1912.	1913.	1914.	1915.	
	Lb.	Lb.	Lb.	Lb.	Lb.
J	3,095	2,627	1,547	2,580	2,462
P	2,733	2,087	1,680	2,907	2,352
R	2,336	3,748	977	3,449	2,627
Average per acre	2,721	2,821	1,401	2,979	
Average per acre on 12 fields	.....	.....	.....	.....	2,480

SCOTT.

EXPERIMENTAL STATION, LETHBRIDGE, ALTA.

REPORT OF THE SUPERINTENDENT, W. H. FAIRFIELD, M.S.

The season of 1915 proved to be very favourable for nearly all kinds of forage crops. The ample rains produced heavy crops of hay and roots and although in the case of corn the amount of growth made was good, still the cooler weather that prevailed on account of the increased precipitation delayed the maturing of the crop. The result was that when killing frost came on the 12th of September no variety, not even the very earliest such as Squaw, was fully ripe, and the ordinary sorts grown for fodder were not so well developed as usual. The yields of hay were good but the showers that where so prevalent during haying time proved such a hindrance to curing that very little No. 1 hay was saved. Of the 30,000 or more tons of alfalfa hay produced on the irrigated lands in the district less than 20 per cent would grade better than No. 2.

The first work on the land was done on March 31. There was very little rain in April but the soil was in prime condition owing to the amount of moisture carried over from the preceding fall and winter.

The germination of the seed of the root crops was good and the generous rains during May, June, and July brought the plants on in a very vigorous condition.

NO IRRIGATION NECESSARY.

As has been the case in the past the experiments with corn and field roots were all carried out both on the irrigated and non-irrigated parts of the farm. On account, however, of the fact that no irrigation was found necessary, this year's report will not be divided into two parts, the irrigated and non-irrigated, as has been the custom in the past, but for the sake of brevity will be combined.

INDIAN CORN.

Fifteen varieties were tested on both the dry and irrigated parts of the Farm with the object in view of producing ensilage. They were all planted May 10 and cut September 14. The preparation of the dry land was summer-fallow which had been manured previous to ploughing for the fallow. On the irrigated land the corn was planted on Brome grass sod that had been broken and backset the previous season. The crop was weighed green and the yield was computed in each case from a plot one one-hundredth of an acre in area. The yield of dry cured fodder would probably be about 40 per cent of the green weight as given.

The interest in the possibilities of corn raising for the production of fodder, especially by farmers on dry land, is increasing rapidly. To get a satisfactory yield of forage from corn in cool short seasons it is necessary to have the land rich and in good tilth. It is, therefore, recommended that the corn be planted only on summer-fallow. The chances of a high yield are materially increased by having a coat of manure applied to th land prvious to ploughing it for the fallow, at which time the land should be ploughed to a depth of seven to eight inches.

INDIAN CORN for Ensilage.—Test of Varieties (Irrigated).

No.	Variety.	Average Height.	Stage of Maturity.	Stand.	Yield per Acre.		
					1st Plot.	2nd Plot.	Average.
		Inches.		p. c.	Tons. Lb.	Tons. Lb.	Tons. Lb.
1	Compton's Early	124	Early Milk	95	29 600	27 1,700	28 1,150
2	Salzer's North Dakota	111	Late Milk	95	30 1,500	23 1,000	27 250
3	Wisconsin No. 7	116	Early Milk	95	30 1,000	21 500	25 1,800
4	King Philip	113	Milk	75	25 500	23 500	24 500
5	White Cap Yellow Dent	116	Late Milk	80	17 600	29 1,700	23 1,150
6	Early Longfellow	110	Early Milk	90	23 600	23 1,700	23 1,150
7	Quebec Yellow	89	Milk	90	24 1,700	19 1,300	22 500
8	Golden Glow	120	Milk	65	22 600	21 1,500	22 50
9	Gehu	73	Glazed	85	22 500	20 600	21 500
10	August Dent	96	Milk	90	18 1,000	24 00	21 500
11	Bailey	116	Late Milk	60	21 500	19 1,000	20 750
12	North Western Dent	104	Milk	70	20 300	17 900	18 1,600
13	Canada Yellow	85	Milk	75	18 1,200	17 900	18 50
14	Free Press	86	Glazed	45	16 00	15 300	15 1,150
15	Squaw	48	Almost Ripe	90	5 1,600	9 500	7 1,050
	Average				21 1,487	20 1,873	21 680

INDIAN CORN for Ensilage.—Test of Varieties (Non-irrigated).

No.	Variety.	Average Height.	Stage of Maturity.	Stand.	Yield per Acre.		
					1st Plot.	2nd Plot.	Average.
		Inches.		p. c.	Tons. Lb.	Tons. Lb.	Tons. Lb.
1	Golden Glow	102	Almost Mature	95	18 1,300	21 1,500	20 400
2	King Philip	86	Milk	80	17 800	20 00	18 1,400
3	Compton's Early	99	Milk	85	16 500	18 500	17 500
4	White Cap Yellow Dent	97	Late Milk	95	18 1,400	14 00	16 700
5	Early Longfellow	90	Late Milk	95	16 300	16 1,000	16 650
6	August Dent	79	Silk	90	16 100	13 1,800	14 1,950
7	Salzer's North Dakota	92	Late Milk	90	16 1,200	12 1,600	14 1,400
8	Gehu	74	Glazed	90	15 100	13 1,000	14 500
9	Wisconsin No. 7	96	Milk	95	15 1,800	12 600	14 250
10	Free Press	64	Almost Ripe	65	12 1,400	14 200	13 800
11	Bailey	86	Late Milk	50	11 1,600	10 700	11 150
12	Quebec Yellow	68	Late Milk	90	11 1,900	9 700	10 1,300
13	North Western Dent	84	Milk	75	12 1,500	7 1,600	10 500
14	Canada Yellow	62	Late Milk	20	7 1,700	8 1,500	8 600
15	Squaw	36	Almost Mature	40	4 1,200	4 1,600	4 1,400
	Average			14	14 320	13 427	13 1,374

From the average results for the past few years the following varieties can be recommended for fodder production: Compton Early, Early Longfellow, North Western Dent and King Philip.

LETHBRIDGE.

FIELD ROOTS.

TURNIPS.

Eighteen varieties of turnips were tested. They were sown May 6 on the dry land on summer-fallow that had been manured before ploughing for the fallow. On the irrigated land they were sown on May 4 on land on which peas had grown the year previous. They were dug November 2. The yield was computed in each case from a one one-hundredth acre plot.

TURNIPS.—Test of Varieties (Irrigated).

No.	Variety.	1st Plot Yield per Acre.		2nd Plot Yield per Acre.		Average Yield per Acre.	
		Tons. Lb.	Bush. Lb.	Tons. Lb.	Bush. Lb.	Tons. Lb.	Bush. Lb.
1	Kangaroo	36 500	1,208 20	41 500	1,375 00	38 1,500	1,291 40
2	Hall's Westbury	39 500	1,308 20	37 1,000	1,250 00	38 750	1,279 10
3	Corning's Lapland	40 00	1,333 20	35 1,000	1,183 20	37 1,500	1,258 20
4	Magnum Bonum	35 00	1,166 40	39 1,500	1,325 00	37 750	1,245 50
5	Prize Purple Top	38 500	1,275 00	36 500	1,208 20	37 500	1,241 40
6	Good Luck	37 1,000	1,250 00	36 00	1,200 00	36 1,500	1,225 00
7	Jumbo	39 00	1,300 00	33 1,500	1,125 00	36 750	1,212 30
8	Hazards Improved	34 1,500	1,158 20	36 00	1,200 00	35 750	1,179 10
9	Perfection	37 500	1,241 40	33 00	1,100 00	35 250	1,170 50
19	Skirving's	35 500	1,175 00	35 00	1,166 40	35 250	1,170 50
11	New Century	35 00	1,166 40	33 500	1,108 20	34 250	1,137 30
12	Halewood's Bronze Top	38 00	1,266 40	28 500	941 40	33 250	1,104 10
13	Canadian Gem	35 500	1,175 00	31 00	1,033 20	33 250	1,104 10
14	Hartley's Bronze Top	33 1,500	1,125 00	31 1,500	1,058 20	32 1,500	1,091 40
15	Empress	32 00	1,066 40	31 00	1,066 40	32 00	1,066 40
16	Mammoth Greystone	29 500	975 00	31 1,000	1,083 20	30 1,750	1,029 10
17	Durham	28 00	933 20	31 1,000	1,083 20	30 500	1,008 20
18	Mammoth Clyde	29 00	966 40	21 1,500	725 00	25 750	845 50
	Average	35 306	1,171 46	33 1,444	1,124 4	34 875	1,147 55

TURNIPS.—Test of Varieties (Non-irrigated).

No.	Variety.	1st Plot Yield per Acre.		2nd Plot Yield per Acre.		Average Yield per Acre.	
		Tons. Lb.	Bush. Lb.	Tons. Lb.	Bush. Lb.	Tons. Lb.	Bush. Lb.
1	Mammoth Greystone	31 1,400	1,056 40	31 300	1,038 20	31 850	1,047 30
2	Perfection	25 700	845 00	27 600	910 00	26 650	877 30
3	Hartley's Bronze Top	25 800	846 40	24 1,900	831 40	25 350	839 10
4	Empress	23 1,800	796 40	25 1,500	858 20	24 1,650	827 30
5	Skirving's	24 1,000	816 40	24 1,500	825 00	24 1,250	820 50
6	Kangaroo	23 1,900	798 20	25 500	841 40	24 1,200	820 00
7	Hall's Westbury	24 500	808 20	24 400	806 40	24 450	807 30
8	Corning's Lapland	24 100	801 40	23 00	766 40	23 1,050	784 10
9	Magnum Bonum	24 00	800 00	22 1,800	763 20	23 900	781 40
10	Jumbo	22 1,300	755 00	23 600	767 40	22 1,950	765 50
11	New Century	22 100	735 00	23 1,100	785 00	22 1,600	760 00
12	Canadian Gem	21 600	710 00	24 00	800 00	22 1,300	755 00
13	Good Luck	22 500	741 40	22 1,400	756 40	22 950	749 10
14	Prize Purple Top	22 100	735 00	21 100	701 40	21 1,100	718 20
15	Halewood's Bronze Top	21 1,000	716 40	20 500	675 00	20 1,750	695 50
16	Durham	20 200	670 00	20 400	673 20	20 300	671 40
17	Hazard's Improved	18 1,500	625 00	21 300	705 00	19 1,900	665 00
18	Mammoth Clyde	19 1,100	651 40	20 00	666 40	19 1,550	659 10
	Average	23 367	772 47	23 1,272	787 52	23 820	780 20

MANGELS.

Thirteen varieties were tested. They were sown on the dry land May 1 on summer-fallow that had been manured just previous to ploughing for the fallow, and on the irrigated land April 29 on land on which peas had been grown the year previous. Only a fair stand was obtained. They were dug October 29.

MANGELS.—Test of Varieties (Irrigated).

No.	Variety.	1st Plot Yield per Acre.		2nd Plot Yield per Acre.		Average Yield per Acre.	
		Tons. Lb.	Bush. Lb.	Tons. Lb.	Bush. Lb.	Tons. Lb.	Bush. Lb.
1	Giant Half Sugar White	32 1,000	1,053 20	39 00	1,300 00	35 1,500	1,191 40
2	Prize Mammoth Long Red	34 00	1,133 20	34 1,000	1,150 00	34 500	1,141 40
3	Yellow Leviathan	32 1,000	1,083 20	36 00	1,200 00	34 500	1,141 40
4	Giant Yellow Intermediate	35 500	1,175 00	33 00	1,100 00	34 250	1,137 30
5	Mammoth Yellow Intermediate	34 500	1,141 40	31 1,000	1,050 00	32 1,750	1,095 50
6	Perfection Mammoth Long Red	33 500	1,108 20	31 1,000	1,050 00	32 750	1,079 10
7	Giant Yellow Globe	30 1,000	1,016 40	32 00	1,066 40	31 500	1,041 40
8	Danish Sludstrup	30 1,000	1,016 40	31 1,000	1,050 00	31 00	1,033 20
9	Improved Mammoth Saw-Log	29 500	975 00	30 1,000	1,016 40	29 1,750	995 50
10	Gate Post	28 1,000	950 00	30 1,000	1,016 40	29 1,000	983 20
11	Golden Tankard	29 00	966 40	26 00	866 40	27 1,000	916 40
12	Mammoth Long Red	26 1,000	883 20	24 1,000	816 40	25 1,000	850 00
13	Selected Yellow Globe	19 00	633 20	23 1,500	791 40	21 750	712 30
	Average	30 769	1,012 49	31 192	1,036 32	30 1,481	1,024 41

MANGELS.—Test of Varieties (Non-irrigated).

No.	Variety.	1st Plot Yield per Acre.		2nd Plot Yield per Acre.		Average Yield per Acre.	
		Tons. Lb.	Bush. Lb.	Tons. Lb.	Bush. Lb.	Tons. Lb.	Bush. Lb.
1	Prize Mammoth Long Red	21 250	704 10	22 650	744 10	21 1,450	724 10
2	Giant Yellow Globe	23 1,000	783 20	18 1,800	630 00	21 400	706 40
3	Mammoth Yellow Intermediate	17 1,100	585 00	20 100	668 20	18 1,600	626 40
4	Mammoth Long Red	17 1,000	583 20	16 1,150	552 30	17 75	567 55
5	Gate Post	16 1,600	560 00	17 300	571 40	16 1,950	565 50
6	Yellow Leviathan	14 850	480 50	18 300	605 00	16 575	542 55
7	Giant Yellow Intermediate	15 550	509 10	13 1,300	455 00	14 925	482 05
8	Golden Tankard	12 500	408 20	15 100	501 40	13 1,300	455 00
9	Selected Yellow Globe	13 1,300	455 00	9 300	305 00	11 800	380 00
10	Danish Sludstrup	2 1,100	85 00	4 400	140 00	3 750	112 30
11	Perfection Mammoth Long Red	1 1,500	53 20	4 1,600	160 00	3 500	109 10
12	Improved Mammoth Saw-Log	2 1,700	95 00	1 400	40 00	2 50	67 30
13	Giant Half Sugar White	2 400	73 20	1 900	48 20	1 1,650	60 50
	Average	12 835	413 55	12 1,023	417 3	12 929	415 29

LETHBRIDGE.

CARROTS.

Five varieties of carrots were tested. They were sown on the dry land May 6, on summer-fallow that had been manured previous to ploughing for the fallow, and on the irrigated land May 5 on Brome grass sod that had been broken and backset the previous season. They were dug on October 30 on the dry land and November 2, on the irrigated land.

CARROTS.—Test of Varieties (Irrigated).

No.	Variety.	1st Plot Yield per Acre.		2nd Plot Yield per Acre.		Average Yield per Acre.	
		Tons. Lb.	Bush. Lb.	Tons. Lb.	Bush. Lb.	Tons. Lb.	Bush. Lb.
1	White Belgian	23 1,500	791 40	23 00	766 40	23 750	779 10
2	Ontario Champion	22 1,200	753 20	20 00	666 40	21 600	710 00
3	Giant White Vosges	18 1,000	616 40	20 00	666 40	19 500	641 40
4	Mammoth White Intermediate	16 00	533 20	20 1,000	683 20	18 500	608 20
5	Improved Short White	19 1,000	650 00	12 500	408 20	15 1,750	529 10
	Average	20 140	669 00	19 300	638 20	19 1,120	653 40

CARROTS.—Test of Varieties (Non-irrigated).

No.	Variety.	1st Plot Yield per Acre.		2nd Plot Yield per Acre.		Average Yield per Acre.	
		Tons. Lb.	Bush. Lb.	Tons. Lb.	Bush. Lb,	Tons. Lb.	Bush. Lb.
1	White Belgian	18 1,200	620 00	15 1,400	523 20	17 300	571 40
2	Giant White Vosges	14 1,700	495 00	15 1,900	531 40	15 800	513 20
3	Mammoth White Intermediate	15 00	500 00	15 1,000	516 40	15 500	508 20
4	Ontario Champion	14 1,300	488 20	15 900	515 00	15 100	501 40
5	Improved Short White	12 800	413 20	14 1,500	525 00	14 150	469 10
	Average	15 200	503 20	15 1,340	522 20	15 770	512 50

From the average results for the past eight years it would appear that the varieties would stand in the order of their merit as follows: White Belgian, Improved Short White and Mammoth White Intermediate.

LETHBRIDGE.

Sugar Beets.

Four varieties of sugar beets were tested. On the dry land they were sown May 6 on summer-fallowed land that had been manured before ploughing for the fallow. On the irrigated land they were sown May 5 on the Brome grass sod that had been broken and backset the previous season. They were dug October 30 and November 2, respectively, on the dry and irrigated land.

Sugar Beets.—Test of Varieties (Irrigated).

No.	Variety.	1st Plot Yield per Acre.		2nd Plot Yield per Acre.		Average Yield per Acre.	
		Tons. Lb.	Bush. Lb	Tons. Lb.	Bush. Lb	Tons. Lb.	Bush. Lb.
1	Vilmorin Improved A	17 500	575 00	18 500	608 20	17 1,500	591 40
2	Raymond Seed	18 00	600 00	15 1,000	516 40	16 1,500	558 20
3	Vilmorin Improved B	14 1,500	491 40	16 500	541 40	15 1,000	516 40
4	Klein Wanzleben	12 500	408 20	13 500	441 40	12 1,500	425 00
	Average	15 1,125	518 45	15 1,625	527 5	15 1,375	522 55

Sugar Beets.—Test of Varieties (Non-irrigated).

No	Variety.	1st Plot Yield per Acre.		2nd Plot Yield per Acre.		Average Yield per Acre.	
		Tons. Lb.	Bush. Lb	Tons. Lb.	Bush. Lb.	Tons. Lb.	Bush. Lb.
1	Klein Wanzleben	14 1,900	498 20	17 1,900	598 20	16 900	548 20
2	Vilmorin Improved B	15 1,100	518 20	15 300	505 00	15 700	511 40
3	Vilmorin Improved A	11 400	373 20	16 1,200	553 20	13 1,800	463 20
4	Raymond Seed	14 700	478 20	13 500	441 40	13 1,600	460 00
	Average	14 25	467 5	15 1,475	524 35	14 1,750	495 50

ALFALFA.

On account of the generous precipitation the yields of hay of all kinds were good on the non-irrigated part of the Station. On the irrigated part the yields of alfalfa were very satisfactory but were no better, and in fact were not quite so good, as has been the case in hotter summers when plenty of irrigation water has been carefully applied. On the dry land alfalfa planted in rows made an excellent showing in regard to yield as compared to that sown in the ordinary way. Notwithstanding the rather wet season there was practically no difference in yield of hay from the two methods of planting. If, therefore, the alfalfa in rows 2½ and 3 feet apart can hold its own in yield in a reasonably wet season as compared to sowing it in the ordinary way, then it would appear that in rows is the proper way to sow it, for in a very dry year absolutely nothing will be cut except when so planted.

On the irrigated part of the Station there were 33 acres of alfalfa from which were cut 143½ tons. The average yield this season from fields that had been seeded for more than one year was 4 tons 1,160 pounds per acre, most of it being cut three times. This is about half a ton less than the average for a few years previous, and is

no doubt due to the cooler weather. In dry, hot seasons when the crop is supplied with water in such a manner that none of it suffers from drouth, the growth is greater than in such a season as the one just past. The average yield in 1915 from fields that had been seeded in 1914 was 3 tons 1,770 pounds per acre.

ALFALFA SEED.

The question of alfalfa seed production is receiving more and more attention each season by farmers on non-irrigated lands. The season, although so extremely favourable for most crops, proved itself to be very unfavourable for seed production. This was due to the fact that during much of the time that the alfalfa was in bloom showery wet weather prevailed. The result was that few of the blooms tripped, and consequently there was very little seed set.

GRASSES AND CLOVER ON THE IRRIGATED LAND.

On irrigated land alfalfa gives much heavier yields than does any other kind of hay as will be noted from what follows in regard to the returns obtained from various fields of grasses, clovers and mixtures:—

		Tons.	Lb.
1 acre	Western Rye grass cut July 20 .. ..yield.	1	130
1 "	Timothy, cut July 20 .. .. "	..	1,820
1 "	Brome Grass, cut July 20 .. .. "	1	100

It has been found that grasses always yield better when mixed with either clover or alfalfa than when sown alone. By comparing the yield from the field of timothy mentioned above the yield from the following field of mixed timothy and clover, the increased yield due to having the mixture will be noticed.

Field of one acre of mixed timothy and clover.

	Tons	Lb.
First cutting made July 20.. .. ..yield.	2	590
Second " " September 16.. .. .. "	1	855
Total..	3	1,445

Another field of mixed timothy and clover (of a little over an acre in area) was cut twice and yielded at the rate of 3 tons, 408 pounds per acre for the season.

EXPERIMENTAL STATION, LACOMBE, ALTA.

REPORT OF THE SUPERINTENDENT, G. H. HUTTON, B.S.A.

INDIAN CORN.

Fifteen varieties of corn were planted May 17, in rows 2½ feet apart and in hills 30 inches apart in the rows. The soil was a heavy black loam that had been broken from sod the previous fall, disced, harrowed and packed then, and again the following spring previous to seeding the corn. The early part of the season was wet and altogether too cold for the growing of corn. However, the warm weather in July and August caused a very good growth of fodder corn that was just beginning to form ears when cut. The duplicate plot system of testing was used, each variety being sown in two plots one-hundredth of an acre in extent and the yield per acre computed from the average of the two plots. The crop was cut September 11.

INDIAN CORN for Ensilage.—Test of Varieties.

No.	Variety.	Average Height.	Stage of Maturity.	Yield per Acre.					
				1st Plot.		2nd Plot.		Average.	
		Inches.		Tons.	Lb.	Tons.	Lb.	Tons.	Lb.
1	Wisconsin No. 7	79½	Ears just forming	12	400	26	00	19	200
2	Golden Glow	91	"	16	500	20	00	18	250
3	King Philip	92½	"	14	00	21	00	17	1,000
4	Salzer's North Dakota	76	"	18	1,600	16	00	17	800
5	North Western Dent	78½	"	17	900	16	1,500	17	200
6	Manitoba	92	"	18	00	16	300	17	150
7	Compton's Early	90½	"	14	600	18	1,400	16	1,000
8	Early Longfellow	85	"	14	1,100	15	1,200	15	150
9	Bailey	88½	"	13	1,800	16	00	14	1,900
10	August Dent	77	"	13	700	15	1,000	14	850
11	Quebec Yellow	84½	"	13	300	14	1,500	13	1,900
12	Canada Yellow	62	"	13	200	13	100	13	150
13	White Cap Yellow Dent	82	"	13	1,100	12	800	12	1,950
14	Gehu	63	"	11	100	12	1,700	11	1,900
15	Free Press	72½	"	9	1,600	11	1,500	10	1,550
	Average	131½		14	446	16	867	15	663

TURNIPS.

Duplicate test plots one one-thirty-two acre each were used to test the twenty-three varieties of turnips grown at this Station in 1915. The land on which these varieties grew was broken from timothy and clover sod in 1914 and well worked down that fall and again the following spring. The seed was planted May 28 on level land in rows two-and-a-half feet apart and the plants thinned out to twelve or fourteen inches apart in the rows. Harvesting was done October 8.

TURNIPS.—Test of Varieties.

No.	Variety.	1st Plot Yield per Acre.		2nd Plot Yield per Acre.		Average Yield per Acre.	
		Tons. Lb.	Bush. Lb.	Tons. Lb.	Bush. Lb.	Tons. Lb.	Bush. Lb.
1	Yellow Aberdeen Purple Top	22 1,140	752 20	22 1,540	759 00	22 1,340	755 40
2	Corning's Lapland	21 1,430	723 30	22 1,410	756 50	22 420	740 20
3	White Globe	20 1,710	695 10	23 990	783 10	22 350	739 10
4	Mammoth Greystone	18 1,750	629 10	25 290	838 10	22 20	733 40
5	Yellow Aberdeen Green Top	21 1,300	721 40	20 00	666 40	20 1,650	694 10
6	Skirving's	20 130	668 50	20 1,320	688 40	20 725	678 45
7	Jumbo	19 1,600	660 00	20 790	679 50	20 195	669 55
8	Hall's Westbury	21 110	701 50	19 150	635 50	20 130	668 50
9	Green Top	21 1,960	732 40	18 300	605 00	20 130	668 50
10	Perfection	19 1,600	660 00	20 260	671 00	19 1,930	665 30
11	Mammoth Clyde	18 830	613 50	21 370	706 10	19 1,600	660 00
12	Canadian Gem	20 1,480	691 20	18 1,220	620 20	19 1,350	655 50
13	Prize Purple Top	19 940	649 00	18 1,820	600 20	19 380	639 40
14	Empress	19 550	642 30	18 40	600 40	18 1,295	621 35
15	Hartley's Bronze Top	19 1,070	651 10	17 850	580 50	18 960	616 00
16	Kangaroo	17 1,770	596 10	17 980	583 00	17 1,375	589 35
17	Magnum Bonum	17 1,900	598 20	17 190	569 50	17 1,045	584 5
18	Halewood's Bronze Top	17 750	579 10	17 580	576 20	17 665	577 45
19	Good Luck	18 560	609 20	15 1,150	519 10	16 1,855	564 15
20	Durham	16 1,660	561 00	16 340	539 00	16 1,000	550 00
21	Hazard's Improved	15 1,020	517 00	15 1,680	528 00	15 1,350	522 30
22	New Century	14 1,170	486 10	16 210	536 50	15 690	511 30
23	White Swede	8 1,290	288 10	7 780	246 20	8 35	267 15
	Average	18 1,640	627 20	18 1,360	622 40	18 1,500	625 00

MANGELS.

Thirteen varieties of mangels were tested in duplicate one one-thirty-two acre plots in 1915. The seed was sown on May 8, on black clay loam soil broken out of timothy and clover sod in July, 1914, and well worked down at once and again in the spring. The seed was sown on the level and the young plants were thinned out to 8 to 10 inches apart.

The roots were harvested on September 25.

MANGELS.—Test of Varieties.

No.	Variety.	1st Plot Yield per Acre.		2nd Plot Yield per Acre.		Average Yield per Acre.	
		Tons. Lb.	Bush. Lb.	Tons. Lb.	Bush. Lb.	Tons. Lb.	Bush. Lb.
1	Giant Half Sugar White	19 1,200	653 20	18 430	607 10	18 1,815	630 15
2	Giant Yellow Globe	18 1,750	629 10	18 430	607 10	18 1,090	618 10
3	Mammoth Yellow Intermediate	17 1,640	594 00	18 1,360	622 40	18 500	608 20
4	Gate Post	19 1,070	651 10	15 620	510 20	17 845	580 45
5	Danish Sludstrup	22 620	743 40	12 160	402 40	17 390	573 10
6	Yellow Leviathan	17 1,240	587 20	16 210	536 50	16 1,725	562 5
7	Perfection Mammoth Long Red	16 600	543 20	16 1,130	552 10	16 865	547 45
8	Prize Mammoth Long Red	17 720	578 40	14 1,960	499 20	16 340	539 00
9	Mammoth Long Red	20 790	679 50	11 440	374 00	15 1,615	526 55
10	Selected Yellow Globe	16 1,530	558 50	14 250	470 50	15 890	514 50
11	Giant Yellow Intermediate	16 210	536 50	14 1,570	492 50	15 890	514 50
12	Golden Tankard	14 380	473 00	16 740	545 40	15 560	509 20
13	Improved Mammoth Saw-Log	15 490	508 10	14 1,040	484 00	14 1,765	496 5
	Average	17 1,711	595 11	15 949	515 49	16 1,330	555 30

CARROTS.

Five varieties of carrots were tested in duplicate one one-thirty-two acre test plots in 1915. The land was black clay loam soil ploughed the previous July 6 inches deep out of timothy and alsike clover sod and well worked down at once . The seed was sown on May 8 on the level and the young plants were later thinned 6 to 8 inches apart in the row. The roots were harvested on October 8.

CARROTS.—Test of Varieties.

No.	Variety.	1st Plot Yield per Acre.		2nd Plot Yield per Acre.		Average Yield per Acre.	
		Tons. Lb.	Bush. Lb.	Tons. Lb.	Bush. Lb.	Tons. Lb.	Bush. Lb.
1	Ontario Champion	7 1,840	264 00	4 1,240	154 00	6 540	209 00
2	Mammoth White Intermediate.	5 300	171 40	7 650	244 10	6 475	207 55
3	White Belgian.	5 960	182 40	6 670	211 10	5 1,815	196 55
4	Improved Short White	5 820	180 20	6 140	202 20	5 1,480	191 20
5	Giant White Vosges	4 1,140	152 20	6 740	212 20	5 940	182 20
	Average	5 1,412	190 12	6 288	204 48	5 1,850	197 30

SUGAR BEETS.

Three varieties of sugar beets were grown in rows 30 inches apart on land broken from sod in 1914, and well worked down. The duplicate plot system was used, each plot being one one-thirty-two acre in size. Seed was planted May 8, and the roots harvested October 8.

SUGAR BEETS.—Test of Varieties.

No.	Variety.	1st Plot Yield per Acre.		2nd Plot Yield per Acre.		Average Yield per Acre.	
		Tons. Lb.	Bush. Lb.	Tons. Lb.	Bush. Lb.	Tons. Lb.	Bush. Lb.
1	Klein Wanzleben	10 990	349 50	11 1,100	385 00	11 45	367 25
2	Vilmorin's Improved "A"	11 40	367 20	8 1,820	297 00	9 1,930	332 10
3	Vilmorin's Improved "B"	7 390	239 50	8 630	277 10	7 1,510	258 30
	Average	9 1,140	319 00	9 1,183	319 43	9 1,162	319 22

ALFALFA.

A little over two acres of alfalfa seeded in 1913 wintered through in very good condition and gave an average yield of three tons forty pounds per acre. Two grades of the Grimm strain are grown, it being found to be the hardiest variety. On the whole, northern grown seed is in most cases most suitable to the conditions of the district. The first cutting was taken off July 26, and a second cutting on September 2.

A test was made of broadcast sowing *vs.* sowing in drills. The average yield per acre for that sown broadcast was 3 tons 600 pounds, while that seeded in drills yielded at the rate of 2 tons 1,500 pounds. The following table shows the yield of alfalfa for this experiment:—

ALFALFA.

Variety.	Grade.	How Sown.	Area..	First Cutting July 26.	Second Cutting Sept. 2.	Total Crop.
			Acre.	Tons. Lb.	Tons. Lb.	Tons. Lb.
Grimm.....	A	Broadcast.....	0·58	1 620	0 1,120	1 1,740
"	B	"	0·58	1 675	0 1,220	1 1,895
"	A	Drills 28" apart.....	0·53	1 000	0 975	1 975
"	B	Drills 28" apart.....	0·53	0 1,860	0 1,000	1 860

TIMOTHY.

The yields of seed and hay from the test plots seeded with different strains of timothy in 1913 is given in the following table. Ten plots are used, half being allowed to produce seed, while the others are cut for hay:—

Plot. No.	Yield of Seed per Acre.			Yield of Ha per Acre.	
	Lb.	Bush.	Lb.	Tons.	Lb.
1.....	405	8	21	2	1,920
2.....	405	8	21	2	1,760
3.....	555	11	27	3	1,200
4.....	535	11	07	2	1,600
5.....	697	14	25	4	160

RED CLOVER.

No seed was secured from the plots of red clover in 1915. The yields of hay from these plots is given herewith:—

Plot No.	Yield of Hay per acre.	
	Tons.	Lb.
1.....	4	1,440
2.....	4	1,440
3.....	4	1,120
4.....	4	1,040
5.....	6	000

EXPERIMENTS WITH GRASSES SEEDED IN 1915.

Thirty-four plots, each one-fortieth of an acre in size, were seeded down to clovers and grasses in 1915. These plots were seeded in duplicate, with the object to compare their value both for hay and seed production.

The following varieties were sown: Red Clover, Alsike clover, Awnless Brome grass, Alfalfa, Timothy, Kentucky Blue grass, Meadow Fescue, Red Top, Orchard grass, Western Rye grass.

LACOMBE.

EXPERIMENTAL STATION, INVERMERE, B.C.

REPORT OF THE SUPERINTENDENT, G. E. PARHAM.

CHARACTER OF SEASON.

The conditions during the season of 1915 were more than ordinarily favourable. The season opened early and cultivation commenced on the land used for the experiments during the third week of March. Within a week after the completion of the sowing of the test plots an abundance of rain fell, and with 3·92 inches in June and 3·79 inches in July, irrigation was not needed, except for mangels, which were irrigated August 12.

That notwithstanding the heavy rainfall recorded above, the mangels needed irrigation is explained by the fact that the soil of the district is very light and porous in character.

The fall was also favourable and the absence of severe frost until later than usual made it possible to harvest a heavier crop of forage corn than in previous years.

INDIAN CORN.

The seed was sown of twelve varieties on land which had, in the year previous, been summer-fallowed. Sown on May 21, the crop was cut on September 17. None of the varieties tested ripened any cobs. The following table gives the yield recorded and height of growth. As regards the quality of the varieties tested as forage plants, the three best, in the order named, were Bailey, Compton's Early and Wisconsin No. 7.

INDIAN CORN.—Test of Varieties.

No.	Variety.	Height.	Yield per Acre.	
		Ft.	Tons.	Lb.
1	Compton's Early	5½	14	380
2	Wisconsin No. 7	6	12	1,560
3	Golden Glow	5	11	680
4	Bailey	7	11	380
5	Salzer's North Dakota	5	10	460
6	Free Press	5	8	1,280
7	White Cap Yellow Dent	5	8	260
8	King Philip	3	7	1,960
9	Quebec Yellow	4½	7	1,600
10	Canada Yellow	2½	7	1,240
11	Early Longfellow	4	6	1,800
	Average	.....	10	146

FIELD ROOTS.

This year nineteen varieties of turnips, thirteen of mangels, five of carrots, and three of sugar beets were tested. The land was treated in the same way for all. It was ploughed in the fall of 1914, and again ploughed and cultivated in the spring. A dressing of farm manure, at the rate of 12 tons to the acre, was then applied, and the land again ploughed and harrowed.

TURNIPS.

Turnips were sown on May 20 and were harvested on October 18. Owing to the fact that there was so much more rain during the season than usual, the turnips were not irrigated. The average yield for all varieties was 11 tons 1,903 pounds per acre.

TURNIPS.—Test of Varieties.

No.	Variety.	Yield per Acre.			
		Tons.	Lb.	Bush.	Lb.
1	Halewood's Bronze Top	14	1,120	485	20
2	Jumbo	13	1,380	456	20
3	Perfection	13	1,040	450	40
4	Carter's Imperial	13	1,040	450	40
5	Invicta	12	1,580	426	20
6	Magnum Bonum	12	1,270	421	10
7	Kangaroo	12	1,270	421	10
8	Mammoth Clyde	12	1,270	421	10
9	Corning's Lapland	12	960	416	00
10	Hartley's Bronze Top	12	700	411	40
11	Good Luck	12	20	400	20
12	Durham	12	20	400	20
13	Hall's Westbury	11	960	382	00
14	Prize Purple Top	11	880	381	20
15	Empress	11	880	381	20
16	Hazard's Improved	10	540	342	20
17	New Century	9	1,420	323	40
18	Canadian Gem	9	1,420	323	40
19	Skirving's	8	430	273	50
	Average	11	1,903	398	23

MANGELS.

Mangels were sown on May 19 and were harvested on October 13. The average yield being 12 tons 322 pounds to the acre.

MANGELS.—Test of Varieties. Yield per acre.

No.	Variety.	Yield per Acre.			
		Bush.	Lb.	Tons.	Lb.
1	Giant Yellow Globe	452	20	13	1,140
2	Gate Post	442	50	13	570
3	Danish Sludstrup	436	50	13	210
4	Prize Mammoth Long Red	433	20	13	..
5	Improved Mammoth Saw-Log	428	..	12	1,680
6	Perfection Mammoth Long Red	424	40	12	1,480
7	Selected Yellow Globe	423	50	12	1,430
8	Giant Yellow Intermediate	416	.	12	960
9	Mammoth Yellow Intermediate	400	20	12	20
10	Mammoth Long Red	390	..	11	1,400
11	Golden Tankard	372	40	11	360
12	Giant Half Sugar White	359	40	10	1,580
13	Yellow Leviathan	289	20	8	1,360
	Average	405	22	12	322

Both turnips and mangels were badly affected by aphis, which were very prevalent throughout the district.

INVERMERE.

CARROTS.

Carrots were sown on May 25 and harvested on October 14. Drills 2 feet apart and plants 4 inches apart in the rows.

CARROTS.—Test of Varieties.

No.	Variety.	Yield per Acre.			
		Bush.	Lb.	Tons.	Lb.
1	Ontario Champion	334	40	10	80
2	White Belgian	276	30	8	590
3	Improved Short White	232	50	6	1,970
4	Giant White Vosges	203	40	6	220
5	Mammoth White Intermediate	20	430	6	220
	Average	250	16	7	1,016

SUGAR BEETS.—Test of Varieties.

No.	Variety.	Yield Per Acre.			
		Bush.	Lb.	Tons.	Lb.
1	Klein Wanzleben	9	450	307	70
2	Vilmorin Improved B	9	380	306	20
3	Vilmorin Improved A	8	1,490	291	30
	Average	9	106	301	46

ALFALFA, CLOVER AND GRASSES.

In addition to the experimental plots planted at the Station in 1914 and mentioned in last year's report, another set of test plots of the same varieties were planted during the season. Of the new plots which are located on the bottom lands in Toby Creek the clovers were winter killed, but the sainfoin and alfalfa survived.

MILLETS.

Three varieties of millet were sown on June 27 and harvested August 30. The following table shows the relative yield of the varieties tested:—

No.	Variety.	Yield per Acre. Tons.	Lb.
1.	Hog Millet	4	25
2.	Siberian Millet	3	1,750
3.	Japanese Barnyard Millet	3	400

EXPERIMENTAL STATION, SUMMERLAND, B.C.

REPORT OF THE SUPERINTENDENT, R. H. HELMER.

In the spring of 1915 land was prepared for testing varieties of grasses and leguminous forage plants for hay and seed production. The piece of land chosen was not very uniform, and some levelling had to be done. Seventeen varieties were sown in one-fiftieth of an acre plots, for hay and for seed production, respectively. Each plot being duplicated, a total of sixty-eight plots were seeded.

The varieties of grasses and leguminous forage plants sown were: Timothy, Orchard grass, Kentucky Blue grass, Red Top, Perennial Rle grass, Western Rye grass, Sheep's Fescue, Meadow Fescue, Hard Fescue, Awnless Brome grass, Siberian Millet, Hog Millet, Japanese Barnyard Millet, Red Clover, Alsike Clover, Alfalfa, Sainfoin.

The plots were sown late owing to the irrigation pipe not being installed until the end of May. They were seeded on June 3, and the first irrigation was applied on June 16.

Some of the plots did not do well. Kentucky Blue grass was very poor and Awnless Brome did not come at all.

The following varieties were cut for hay and yielded as follows:—

Timothy	2 tons	1,350	lb. per acre.
Orchard grass	1 "	1,600	"
Red Clover	2 "	1,400	"
Alsike clover	2 "	1,600	"
Alfalfa	2 "	1,400	"
Sainfoin	1 "	350	"
Japanese Barnyard Millet	4 "	300	"
Siberian Millet	4 "	200	"
Hog Millet	3 "	60	"

EXPERIMENTAL STATION, AGASSIZ, B.C.

REPORT OF THE SUPERINTENDENT, P. H. MOORE, B.S.A.

SEASON.

The season of 1915 was very hot and dry, especially in the months of July, August and September, and, although there were 27 inches of rain between April 1 and October 31, forage crops generally suffered during midsummer. As a contrast to 1914, which was also very dry, April, May and June of 1915 proved wet enough for all hoed crops. Although June did not have any heavy rains there was a continuation of light showers and foggy weather during the month which made hoeing very difficult. From July 1 to September 30 there was little or no rain and the temperature was much higher than in the year 1914. Such conditions adversely affected the root crops but favoured the production of a corn crop of excellent quality. Taking the growing season as a whole there was enough moisture supplied, and on well cultivated lands the drought was not seriously felt. No frost was recorded from May 1 to October 31.

1915.	April.	May.	June.	July.	August.	Sept.	October.	Total.
Precipitation.....	5·37	5·2	2·36	1·62	·07	1·26	11·26	27·14
Hours sunshine....	139·6	131·1	138·1	195·0	172·0	109·6	59·4	944·8
	°	°	°	°	°	°	°	Average.
Highest Temp....	76	81	91	95	98	81	68	84·23
Lowest Temp.....	51	35	42	40	45	40	33	38·0
Mean Monthly Temp.	50·12	54·27	59·44	62·9	66·22	56·73	48·07	56·82

SOIL AND MANURING.

The soil on which the forage crops were grown was a sandy loam which had made a full cycle under the four-year rotation system followed at the Farm.

The land which was a clover and rye grass pasture in 1914, was manured during the fall with 20 tons of barnyard manure per acre, and ploughed in the late winter. The root crops received in addition 600 pounds of the following mixture:—Nitrate of soda, 100 pounds; sulphate of potash, 150 pounds; superphosphate, 350 pounds.

This mixture was applied in the drills at the time they were set up, *i.e.*, immediately before seeding.

INDIAN CORN.

Seventeen varieties of corn were tested this year by the double plot system. They were all planted May 17 and harvested October 2, making a growing season, without frost, for 138 days. The gross tonnage per acre was light, but the maturity was such that the yield of dry matter per acre was in excess of that of the average year.

A season such as that of 1915 gives an unexpected advantage to the large dent varieties, but it is an advantage they can only get about one year in ten. This year

varieties such as Wisconsin No. 7 and White Cap Yellow Dent gave the largest gross yields. They were not leafy, however, and had few ears which bore soft watery kernels. In contrast to this the very early varieties, such as Canada Yellow, August Dent, and Quebec Yellow, gave very light gross yields but produced a good quantity of ripe grain. All the above mentioned varieties do not give good yields in an average season and are not to be recommended for silage purposes for this district.

The varieties which have best stood the test for making a first-class ensilage are: Longfellow, Smoky or Northwestern Dent, and Compton's Early. Other varieties worthy of mention are, King Philip, Golden Glow, and Salzer's North Dakota, although in some seasons they have given very inferior results.

In all the variety tests the corn was planted in hills 3 feet apart each way with an average of six seeds to the hill.

All the corn planted was treated with tar, which most effectively kept the crows and pheasants from eating the seed. The method of treating the corn used by the Farm is as follows:—The seed is immersed in warm water until thoroughly warm. It is then placed in a tub and about four tablespoons of pine tar per bushel are added. This is then stirred with a stick until all the seed is of even colour, when it is thinly spread out on the floor to dry. Seed thus treated will go through the ordinary corn planter, but if one wishes to use it before it is dry some dust or ashes can be sprinkled over it in order to prevent the kernels from sticking together.

INDIAN CORN FOR ENSILAGE.—Test of Varieties.

No.	Variety.	Average Height.	Stage of Maturity.	Yield per Acre.					
				1st Plot.		2nd Plot.		Average.	
		Inches.		Tons.	Lb.	Tons.	Lb.	Tons.	Lb.
1	Wisconsin No. 7	98	Soft dough, medium for silage	16	510	13	1,640	15	75
2	White Cap Yellow Dent	96	Soft dough, very poor ears	14	910	14	630	14	770
3	Golden Glow	98	Glazed, well eared	14	1,760	12	1,670	13	1,715
4	Longfellow	94	Glazed, well eared					13	800
5	Bailey	100	Very soft, poor colour	13	870	12	1,670	13	270
6	Leaming	102	Very soft, uneven	10	170	16	300	13	235
7	King Philip	88	Some ears ripe, some in dough	9	1,750	15	540	12	1,145
8	Howie	76	Soft dough, very poor colour	10	1,580	13	1,780	12	680
9	Compton's Early	78	Glazed	10	1,440	13	1,220	12	330
10	Salzer's North Dakota	94	Glazed, above medium for silage	12	1,530	10	1,860	11	1,695
11	Smoky Dent	96	Glazed, very good for silage	10	1,300	13	90	11	1,695
12	Early Longfellow	86	Glazed, very leafy, good for silage	13	1,500	9	1,180	11	1,340
13	Essex Dent	86	Soft dough, poor for silage	12	680	10	730	11	705
14	Quebec Yellow	62	Ripe	10	730	10	450	10	590
15	Free Press	57	Ripe	11	460	7	930	9	695
16	Canada Yellow	54	Ripe	9	330	6	760	7	1,545
17	August Dent	84	Ripe, poor for silage	8	220	7	390	7	1,305
	Average			11	1,797	11	1,685	11	1,741

INDIAN CORN.—Average Yields for five years.

Variety.	Yield per Acre. Tons.	Lb.
Wisconsin No. 7	14	825
White Cap Yellow Dent	14	624
Compton's Early	14	476
Golden Glow	13	871
Longfellow	13	347
Salzer's North Dakota	12	448

AGASSIZ.

TURNIPS.

Seventeen varieties of turnips were tested. They were planted on April 29 and harvested November 15, thus having had a growing season of 201 days.

The season was most unsatisfactory for turnips. The germination was perfect and very little trouble was caused by "cabbage maggot," but the "aphid" in mid-summer very seriously affected the crop. When the fall rains came and the "aphids" were destroyed, the turnips began to grow, producing a little more than a half of an ordinary crop. The following list gives the results of the trials this year, but as the plots were badly infested with aphis the figures can hardly be considered indicative of the relative merits of the varieties:—

TURNIPS.—Test of Varieties.

No.	Variety.	1st Plot Yield per Acre.		2nd Plot Yield per Acre.		Average Yield per Acre.	
		Tons. Lb.	Bush. Lb.	Tons. Lb.	Bush. Lb.	Tons. Lb.	Bush. Lb.
1	Hall's Westbury	13 400	440 00	15 1,700	528 20	14 1,050	484 10
2	Kangaroo	15 1,900	531 40	13 200	436 40	14 1,050	484 10
3	Empress	16 1,400	556 40	11 600	376 40	14 00	466 40
4	Durham	13 1,500	458 20	13 1,700	461 40	13 1,600	460 00
5	New Century	14 500	475 00	13 400	440 00	13 1,450	457 30
6	Jumbo	13 500	441 40	13 1,000	450 00	13 750	445 50
7	Halewood's Bronze Top	12 1,200	420 00	13 1,700	461 40	13 450	440 30
8	Hartley's Bronze Bop	13 00	433 20	13 500	441 40	13 250	437 30
9	Hazard's Improved	14 00	466 40	11 1,300	388 20	12 1,650	427 30
10	Canadian Gem	15 1,500	525 00	9 00	300 00	12 750	412 30
11	Good Luck	12 00	400 00	12 00	400 00	12 00	400 00
12	Corning's Lapland	10 00	33 20	13 1,800	463 20	11 1,900	398 20
13	Perfection	13 1,700	461 40	9 900	315 00	11 1,300	388 20
14	Mammoth Clyde	15 200	503 20	8 100	268 20	11 1,150	385 50
15	Magnum Bonum	8 1,700	295 00	13 1,300	455 00	11 500	375 00
16	Skirving's	7 1,700	261 40	10 300	338 20	9 00	300 00
	Average	13 262	437 42	12 469	407 49	12 1,366	422 46

TURNIPS.—Average Yields.

Variety.	Yield per Acre.			
	Tons.	Lb.	Bush.	Lb.
Hall's Westbury (Average of five years)	26	980	883	00
Bangholm "	23	1,533	792	13
Hazard's Improved. "	23	383	773	3
Halewood' Bronze Top "	21	1,962	732	42
Hartley's Bronze Top "	20	988	683	8
Good Luck "	19	1,056	650	56
Magnum Bonum.... "	19	322	638	42
Perfection "	19	272	637	52
Mammoth Clyde "	18	681	611	21
Jumbo "	18	2	600	2
New Century (average of three years.)	25	915	848	35
Corning's Lapland "	22	633	743	53

MANGELS.

Fourteen varieties of mangels were tested. They were planted April 28 and harvested November 12, the growing season being 199 days. They were sown at the rate of 10 pounds of seed per acre and 1 inch deep. The rows were 30 inches apart and the plants were thinned to 14 inches in the row. This method gave 100 per cent stand of young plants which made exceptionally good growth until the end of July. From the end of July until the end of September they made very little growth and, had it not been for the excellent stand, the crop would have been most disappointing. A great many of the varieties were very mixed and did not show much uniformity of type.

The highest yielder this year was Giant Half Sugar White, followed closely by Prize Mammoth Long Red, Gate Post, and Mammoth Long Red.

The mangels seem to be better suited to the conditions of the district than are turnips, and can on the whole be more depended on for yielding profitably.

MANGELS.—Test of Varieties.

No.	Variety.	1st plot yield per acre.		2nd plot yield per acre.		Average yield per acre.	
		Tons. Lb.	Bush. Lb.	Tons. Lb.	Bush. Lb.	Tons. Lb.	Bush. Lb.
1	Giant Half Sugar White	26 600	876 40	26 00	866 40	26 300	871 40
2	Prize Mammoth Long Red	23 400	773 20	28 1,600	960 00	26 00	866 40
3	Gate Post	25 1,400	856 40	26 500	875 00	25 1,950	865 50
4	Mammoth Long Red	24 1,800	830 00	26 1,800	896 40	25 1,800	863 20
5	Giant Yellow Intermediate	27 1,500	925 00	22 1,600	760 00	25 550	842 30
6	Selected Yellow Globe	23 1,200	786 40	26 1,000	883 20	25 100	835 00
7	Improved Mammoth Saw-Log	23 1,600	793 20	24 1,500	825 00	24 550	809 10
8	Selected Yellow Globe	19 1,400	656 40	28 700	945 00	24 50	800 50
9	Yellow Leviathan	21 1,100	718 20	26 800	880 00	23 1,950	799 10
10	Mammoth Yellow Intermediate	22 1,300	755 00	22 1,000	750 00	22 1,150	752 30
11	Danish Sludstrup	25 100	835 00	19 1,500	658 20	22 800	746 40
12	Golden Tankard	19 900	648 20	22 1,800	763 20	21 350	705 50
	Average	23 1,275	787 55	25 317	838 37	24 796	813 16

MANGELS.—Average Yields.

Variety.	Yield per acre.	
	Tons. Lb.	Bush. Lb.
Giant Yellow Intermediate (average of five years)	24 232	803 52
Selected Yellow Globe (average of five years)	22 1,193	753 13
Giant Half Sugar White (average of five years)	22 912	748 32
Prize Mammoth Long Red (average of five years)	22 536	742 16
Perfection Mammoth Long Red (average of five years)	22 512	741 52
Gate Post (average of five years)	22 181	736 21
Giant Yellow Globe (average of four years)	24 1,398	823 18
Danish Sludstrup (average of three years)	27 933	915 33
Yellow Leviathan (average of three years)	25 1,891	864 51
Mammoth Long Red (average of three years)	25 732	845 32
Golden Tankard (average of three years)	20 708	678 28
Mammoth Yellow Intermediate (average of three years)	18 1,269	621 9

AGASSIZ.

CARROTS.

Five varieties of field carrots were tested. They were sown April 29 and harvested November 13, thus having a growing season of 199 days. The carrots yielded higher than any other root crop of the season, and results obtained during the last five years indicate, on the whole, that carrots should receive more attention in this district. The highest yield this year was made by a favourite in the valley, the Improved Short White. This yielded 34 tons 700 pounds. It also heads the list for average yield over a period of five years. The carrots seem to produce better crops on lighter soils and in drier seasons than mangels or turnips. As far as keeping qualities are concerned they stand up better than turnips but not quite so well as mangels. If thinned too much—12 inches or more—they grow to an enormous size and are apt to split, loss in the pit always following. When thinned to 6 to 8 inches in the row the individual root is smaller but the total yield is not affected and the keeping quality is much improved. In feeding quality they compare very favourably with mangels for milk and butter production.

CARROTS.—Test of Varieties.

No.	Variety.	1st plot yield per acre.		2nd plot yield per acre.		Average yield per acre.	
		Tons. Lb.	Bush. Lb.	Tons. Lb.	Bush. Lb.	Tons. Lb.	Bush. Lb.
1	Improved Short White.....	32 1,900	1,098 20	35 1,500	1,191 40	34 700	1,145 00
2	Mammoth White Intermediate.....	30 00	1,000 00	37 200	1,236 40	33 1,100	1,118 20
3	White Belgian.....	33 400	1,106 40	31 00	1,033 20	32 200	1,070 00
4	Giant White Vosges.....	27 1,900	931 40	26 1,500	891 40	27 700	911 40
5	Ontario Champion	30 200	1,003 20	21 1,400	723 20	25 1,800	863 20
	Average.....	30 1,680	1,028 00	30 920	1,015 20	30 1,300	1,021 40

CARROTS.—Average Yields.

Variety.	Yield per acre.			
	Tons.	Lb.	Bush.	Lb.
Improved Short White (average of five years).....	28	49	934	9
Mammoth White Intermediate (average of five years).....	26	1,125	885	25
White Belgian (average of five years).....	25	1,549	859	9
Ontario Champion (average of five years.....	23	518	775	18
Half Long Chantenay (average of three years).....	17	1,337	588	57

SUGAR BEETS.

Three varieties of sugar beets were tested this year. They were sown April 29 and harvested November 13, thus having a growing season of 199 days. Vilmorin A gave the highest gross yield, very closely followed by Vilmorin B, but on a period of three years Vilmorin B has given the highest yield.

SUGAR BEETS.—Test of Varieties.

No.	Variety.	1st plot yield per acre.		2nd plot yield per acre.		Average yield per acre.	
		Tons. Lb.	Bush. Lb.	Tons. Lb.	Bush. Lb.	Tons. Lb.	Bush. Lb.
1	Vilmorin Improved "A"	16 1,600	560 00	14 1,600	493 20	15 1,600	526 40
2	Vilmorin Improved "B"	16 1,400	556 40	14 500	475 00	15 950	515 50
3	Klein Wanzleben	15 1,700	528 26	13 1,500	458 20	14 1,600	493 20
	Average	16 900	548 20	14 533	475 33	15 717	511 57

SUGAR BEETS.—Average Yields.

Variety.	Yield per acre.			
	Ton.	Lb.	Bush.	Lb.
Vilmorin Improved A (average of five years)	15	341	505	41
Klein Wanzleben (average of five years)	15	339	505	39
French Very Rich (average of five years(	12	1,986	433	6
Vilmorin Improved B (average of three years)	16	1,678	561	18

AGASSIZ.

SESSIONAL PAPER No. 16

MANGEL SEED PRODUCTION.

During the season a plot was devoted to mangel seed production. The variety used was Danish Sludstrup and the mother plants were grown from seed imported direct from Denmark. The mother plants were pitted in the field and covered with straw and earth. This stock was smooth and uniform in type and averaged 4 pounds per root. They were planted in the field in rows 3 feet apart and the plants 2 feet apart in the rows. The yield of seed was very satisfactory and the seed was of high germination, being 95 per cent balls, 188 per cent sprouts.

The work of harvesting and threshing was mostly done by hand and the cost was consequently high, but the returns justified the expenditure.

Cost of Production per Acre.

Mother seed 7,260 roots, 29,040 pounds at $5 per ton, pitted	$ 72 60
Hauling and distributing from pit, man and horse 48·4 hours at 32·5 cents	15 73
Planting, 2 men 96·8 hours at 40 cents	38 72
Cultivating 4 times, man and horse 24·2 hours at 32·5 cents	7 86
Hoeing 4 times, 121 hours at 20 cents	24 20
Harvesting by hand, 48·4 hours at 20 cents	9 68
Hauling to barn, man and horse 9·5 hours at 32·5 cents	3 08
Threshing by hand, 121 hours at 20 cents	24 20
Fanning and cleaning, 60 hours at 20 cents	12 00
	$208 07
Total yield of seed per acre, 2,202·2 pounds.	
Total yield of No. 1 seed per acre, 2,105·4 pounds.	
Value of No. 1 seed per acre at 18 cents per pound	$378 97
Cost per pound total seed, 9·4 cents.	
Cost per pound No. 1 seed, 9·8 cents.	
Profit per acre	$170 90

GRASSES AND CLOVERS.

Thirty plots were laid out and sown with different clovers and mixtures of clovers and grasses with an idea of ascertaining the best mixtures for a 3- and a 4-year rotation. Grimm's alfalfa was also planted at various rates of seeding per acre on limed and inoculated land. All of these plots were sown without nurse crops. Some crop was cut from the clover plots this year, but not from the alfalfa nor from the clover and grass mixtures. This work is being continued and it will take several years before any definite conclusions will be reached.

EXPERIMENTAL STATION FOR VANCOUVER ISLAND, SIDNEY, B.C.

REPORT OF THE SUPERINTENDENT, LIONEL STEVENSON, M.S.

CHARACTER OF THE SEASON.

The season of 1915 was remarkable for light rainfall and high mean temperatures. The winter months were especially mild and many plants grew continuously. Volunteer oats, barley and wheat had attained heights varying from 15 to 30 inches by the first of April. The growth of all plants went on unchecked until the dry weather of July set in. The scanty precipitation during July, August and September was not sufficient to maintain the growth of any forage plants excepting silver beet and alfalfa. The yield of all forage crops was somewhat reduced owing to the drought conditions.

SOME WEATHER OBSERVATIONS taken at the Experimental Station.

Month.	Temperature F.			Precipitation.		
	Mean.	Highest.	Lowest.	Rainfall.	Heaviest in 24 hours.	Sunshine.
	°	°	°	inches.	inches.	hours.
January	38·50	49·0	27·5	2·77	0·56	70·4
February	41·60	51·0	31·0	1·66	0·35	65·9
March	47·0	64·0	35·0	1·65	0·40	142·7
April	51·0	70·0	35·0	1·65	0·69	223·4
May	55·0	75·5	40·0	2·06	0·36	181·2
June	59·95	86·0	46·0	0·74	0·26	304·0
July	63·39	92·0	45·0	1·30	0·83	297·2
August	65·0	90·5	48·0	0·03	0·03	274·6
September	54·59	72·0	42·0	0·76	0·30	191·1
October	50·30	62·0	39·0	4·17	0·68	104·1
November	40·80	53·0	30·0	4·82	0·59	70·9
December	39·05	51·0	26·0	6·89	1·21	58·6
Total for year				28·04		1984·1
Average for year				2·33		165·4
Total for eight growing months, March to October					11·90	
Average for eight growing months				1·49		

SOIL.

The soil of the area used for experiments with forage plants is a light loam, containing large percentage of sand and small gravel. The subsoil is a clay-gravel hardpan which is in many places impervious to water. This area was cleared in 1913-14 and has produced but one previous crop. The soil will be much improved when drainage is completed.

INDIAN CORN.

Fifteen varieties of corn were tested in plots on soil uniform in character. The land was spring ploughed and well tilled, but no manure of any kind was used. The corn was sown in drills and the plants were thinned to distances of from 9 to 10 inches in the row. May the first was the date of seeding and all varieties had either reached or passed the dough stage by September 25. The early flint varieties, Canada Yellow, Quebec Yellow and Free Press were ready for the silo September 1. All varieties were permitted to ripen and seed of good quality was saved. All varieties of corn, however, ripened unevenly, ears in the dough stage and ripe cobs being found in the same row and frequently on the same plant.

A plot of Stonewell's Evergreen, one half acre in extent, was sown in drills on May 7. This variety retained its green character until November 2 and was harvested for feed from September 1 until November 8. Stonewell's Evergreen approaches nearer what is wanted for this district than any of the others.

INDIAN CORN for Ensilage.—Test of Varieties.

No.	Variety.	Average Height	Stage of Maturity.	Yield per Acre.	
		Inches.		Tons.	Lb.
1	Stowell's Evergreen	112	Glazed	35	200
2	Essex Dent	85	"	17	1,700
3	Golden Glow	86	"	13	1,000
4	Wisconsin No. 7	84	"	11	500
5	Leaming	84	"	10	1,600
6	White Cap Yellow Dent	84	"	10	1,500
7	King Philip	79	"	10	650
8	Howie	80	"	10	450
9	Bailey	80	"	9	1,500
10	Compton's Early	78	"	9	1,100
11	Salzer's North Dakota	81	"	9	300
12	Longfellow	76	"	8	1,350
13	Quebec Yellow	44	"	6	1,050
14	Canada Yellow	50	"	6	300
15	Free Press	49	"	6	50
	Average			11	1,420

SIDNEY.

TURNIPS.

Nineteen varieties of turnips were sown in one-fiftieth acre plots May 1, at a rate of two pounds per acre. All varieties had germinated by May 6. They were harvested March 23, 1916.

All varieties yielded a very light crop as shown by the following table. The low yield was due principally to the dryness of July and August which checked the growth, and at the same time favoured the development of aphis. Two nicotine sprayings were applied in an attempt to control the aphis, but the insects appeared in such numbers, owing to the favourable breeding weather, that the spraying proved of but little use.

TURNIPS.—Test of Varieties.

No.	Variety.	Yield per Acre.			
		Tons.	Lb.	Bush.	Lb.
1	New Century	7	1,500	258	20
2	Canadian Gem	6	1,750	229	10
3	Hazard's Improved	6	600	210	00
4	Purple Top	6	100	201	40
5	Magnum Bonum	5	1,300	188	20
6	Durham	5	1,100	185	00
7	Hartley's Bronze Top	5	1,000	183	20
8	Corning's Lapland	5	600	176	40
9	Carter's Imperial	5	100	168	20
10	Good Luck	4	1,900	165	00
11	Skirving's	4	700	145	00
12	Halewood's Bronze Top	4	500	141	40
13	Jumbo	3	1,300	121	40
14	Hall's Westbury	3	1,100	118	20
15	Perfection	3	700	111	40
16	Mammoth Clyde	2	1,800	96	40
17	Empress	2	1,400	90	00
18	Invicta	2	1,000	83	20
19	Kangaroo	1	500	41	40
	Average	4	1,208	153	28

MANGELS.

Thirteen varieties were tested in one-fiftieth acre plots. They were sown April 30 at a rate of 4 pounds to the acre and harvested November 20.

MANGELS.—Test of Varieties.

No.	Variety.	1st Plot Yield per Acre.			
		Tons.	Lb.	Bush.	Lb.
1	Giant Yellow Intermediate	20	800	680	00
2	Prize Mammoth Long Red	16	1,800	563	20
3	Giant Half Sugar White	15	700	551	40
4	Gate Post	14	1,200	486	40
5	Mammoth Long Red	13	900	448	20
6	Giant Yellow Globe	13	900	448	20
7	Selected Yellow Globe	13	100	435	00
8	Danish Sludstrup	12	1,500	425	00
9	Perfection Mammoth Long Red	11	100	368	20
10	Mammoth Yellow Intermediate	10	1,900	365	00
11	Golden Tankard	10	1,300	355	00
12	Evans Saw-Log	10	1,300	355	00
13	Yellow Levaithen	9	1,100	318	20
	Average	13	585	443	5

SIDNEY.

CARROTS.

Five varieties of carrots were tested in one-fiftieth acre plots. They were sown April 30 at the rate of 2 pounds to the acre and harvested November 19.

CARROTS.—Test of Varieties.

No.	Variety.	Yield per Acre.			
		Tons.	Lb.	Bush.	Lb.
1	Ontario Champion	26	100	868	20
2	Improved Short White	22	200	736	40
3	Mammoth White Intermediate	22	....	733	20
4	Giant White Vosges	20	1,100	685	00
5	White Belgian	16	100	535	00
	Average	21	700	711	40

SUGAR BEETS.

Three varieties of sugar beets were sown in one-fiftieth acre plots April 30, at a rate of 4 pounds to the acre. They were harvested November 18, and yielded as follows:—

SUGAR BEETS.—Test of Varieties.

No.	Variety.	Yield per Acre.			
		Tons.	Lb.	Bush.	Lb.
1	Vilmorin Improved "B"	12	500	408	20
2	Vilmorin Improved "A"	10	950	349	10
3	Klein Wanzelben	7	1,400	256	40
	Average	10	283	304	43

Experiments with thinning of mangels, carrots, and sugar beets to different distances:—

	Thinned to—	Yield per Acre. Tons.	Lb	Bush.	Lb.
Mangels	8 inches.	12	1,720	428	40
"	12 "	13	550	442	30
Carrots	8 "	21	1,880	731	20
"	12 "	20	1,320	688	40
Sugar beets	8 "	10	60	334	20
" "	12 "	10	500	341	40

SILVER BEET.

A plot of silver beet, also known as chard, was sown June 2, 1914. The plants were singled at a distance of 2 by 3 feet, making 7,260 plants per acre. Three crops were harvested during the season of 1915. The first crop was harvested on June 2, 1915, and yielded 27 tons 450 pounds. The second crop was harvested July 15, and yielded 24 tons 1,909 pounds. The third crop was harvested October 8, and yielded 18 tons 261 pounds.

SIDNEY.

Total yield for season: 70 tons 620 pounds of very palatable and nutritious dairy cow, poultry, and swine feed.

The "silver beet" will very likely prove a very valuable addition to the forage crops of this district. The plants were very clean, vigorous growers and free from aphis or other insect injury. The yields for the season of 1916 will probably be much heavier as the root system was greatly increased and strengthened this year. With irrigation four or more crops could be secured per season.

ALFALFA.

Two varieties of alfalfa were under test, the Grimm and the Ontario Variegated. The plots of alfalfa were seeded in drills during June, 1914, and were cultivated during the season. A portion of the seed was sown without bacterial inoculation. This area made weak growth both during the first and second season, but established itself, proving that it is possible to grow alfalfa in the district without inoculation. The plot sown with treated seed made good growth the first season and produced three good crops in 1915, thus clearly demonstrating the benefits of soil inoculation for the alfalfa plant.

SORGHUM.

A plot was sown on June 8, 1915, and harvested on November 3 of same season. It attained an average height of 48 inches and yielded at the rate of 14 tons per acre.

RED CLOVER.

A plot was sown on May 23, 1914, and harvested July 2, 1915, yielding 2 tons 600 pounds per acre.

ALSIKE CLOVER.

Sown May 25, 1914, and harvested July 2, 1915, yielding 4 tons 134 pounds per acre.

RED TOP.

Sown May 23, 1914, and harvested July 2, 1915, yielding 3 tons 200 pounds per acre.

SIDNEY.

SUBSTATION, FORT VERMILION, ALTA.

REPORT OF THE EXPERIMENTALIST, ROBERT JONES.

SEASON.

The season of 1915 was not especially favourable for the growing of forage crops. These crops do best in a moist season, when the rainfall is more abundant than it has been with us during the past summer. The summer of 1915 was rather dry for the best results even in grain growing, and consequently crops demanding abundance of moisture were somewhat at a disadvantage. The first autumn frost occurred on the night of September 10, but the real killing frost did not occur until the night of the 12th, and since then the nights have been quite frosty, with fine days. These cold nights have caused root and potato crops to be taken up earlier than usual.

INDIAN CORN.

The past season was quite unfavourable for the growing of corn on account of the cool weather experienced during the spring. The corn had just got nicely started when it was cut down by a severe frost that occurred on the night of June 14-15. Some plots were completely killed. What recovered from this setback did fairly well, but did not reach its usual height. All plots were cut on September 17 and 18, after another severe frost which occurred on the night of September 15. Of the varieties tested none was fit for use.

Six varieties of corn were planted on April 28 and 29 in hills 30 inches apart each way. The soil was a dark clay loam which was ploughed out of hay sod in the early part of July, 1914. After the hay had been removed, manure was applied at the rate of about 15 tons per acre. It was disced in and the harrow run over a number of times during the autumn to conserve the moisture.

INDIAN CORN for Ensilage.—Test of Varieties.

No.	Variety.	Average Height.	Stage of Maturity.	Yield per Acre. Average.	
		Inches.		Tons.	Lb.
1	Compton's Early	60	Tasselled	10	1,420
2	King Philip	46	"	7	700
3	Salzer's North Dakota	42	In silk	7	400
4	Early Canada Eight Rowed	36	Tasselled	4	1,960
5	Longfellow	30	In silk	2	1,460
6	Angel of Midnight	24	Not tasselled	2	560
	Average			5	1,750

In the spring of 1915 the land was again lightly disced and then harrowed with the smoothing harrow and the seed planted at once.

All plots one-sixtieth of an acre.

The following are the yields obtained:—

TURNIPS.

Five varieties of turnips were sown on May 4, in plots of one-sixtieth of an acre. The rows were 26 inches apart and the plants thinned out on June 21 to about 10 inches apart. Throughout the season cultivation with hoe and hand scuffler was given to keep the crop free from weeds and the soil in good tilth. The resulting crop as harvested on the 15th and 16th of September was of a medium size and the roots good in quality. The turnips were not attacked by any pest or disease.

TURNIPS.—Test of Varieties.

	Yield per Acre.			
	Tons.	Lb.	Bush.	Lb.
1. Hall's Westbury	26	1,520	....	892
2. Perfection	23	800	780	
3. Good Luck	23	80	768	
4. Hartley's Bronze Top	20	1,700	695	
5. Magnum Bonum	16	1,600	560	
Average	22	340	739	

MANGELS.

The land on which all of the mangels were grown had the same treatment as that for the corn only it was gone over a second time with the disc to make a finer seed bed. All plots were one-sixtieth of an acre in size. The seed was sown in rows 24 inches apart and the plants thinned to about 8 or 10 inches apart. The season was rather dry for the best results. The germination of the seed was not very good, and as a result the comparison of the varieties are not in all cases as fair as might be. The seed was sown on April 23 and the crop harvested on September 13.

MANGELS.—Test of Varieties.

	Yield per Acre.			
	Tons.	Lb.	Bush.	Lb.
1. Giant Yellow Globe	23	500	775	
2. " " Intermediate	20	80	668	
3. Prize Mammoth Long Red	19	1,780	663	
Average	21	120	702	

CARROTS.

Four varieties of field carrots were seeded on the level in rows 24 inches apart on soil similar to that on which the mangels were seeded and handled in a similar manner. The seed was sown on April 24 and the crop was harvested on September 14. Considering the dryness of the season the results are quite satisfactory. All plots one-sixtieth of an acre.

CARROTS.—Test of Varieties.

	Yield per Acre.			
	Tons.	Lb.	Bush.	Lb.
1. Half Long Chantenay	27	480	908	
2. Mammoth White Belgian	25	1,900	865	
3. Ontario Champion	19	700	645	
4. White Belgian	18	780	613	
Average	22	1,465	757	45

FORT VERMILION.

SUGAR BEETS.

Two varieties of sugar beets were sown on April 26 in plots of one-sixtieth of an acre in size. They were sown in rows 24 inches apart on soil similar to that on which the rest of the roots were grown and given the same cultivation. The yields obtained are somewhat below the average. The plots were harvested on September 20.

SUGAR BEETS.—Test of Varieties.

	Yield per Acre.			
	Tons.	Lb.	Bush.	Lb.
1. Klein Wanzleben	17	800	580	
2. Vilmorin Improved	16	1,900	565	
Average	17	350	572	30

GRASSES, CLOVERS, AND ALFALFA.

The land on which these forage plants were seeded was in summer-fallow the previous season and kept well cultivated to conserve as much of the moisture as possible and to keep the soil in good tilth.

The seed was sown with a hand seeder in drills 8 inches apart. Some cultivation was given during the first season to keep down weeds so as to give the young plants a chance to make a good start.

This summer after the first cutting was removed the plots were run over with a smoothing harrow to loosen up the top soil and prevent what little moisture was in the soil from evaporating. This harrowing was very beneficial.

Grasses.—In grasses, Brome grass was the only one of which there was any to cut. The plots of other varieties were ploughed in 1914 on account of the poor catch, and none were seeded this spring as the seed arrived too late to be used this season. The plot of Brome grass of one-thirtieth of an acre was cut on July 16 and gave a yield of 2 tons and 850 pounds of fine hay.

Red Clover.—The plot of one-sixtieth of an acre of red clover that was sown on May 25, 1914, has done quite well and came through the winter fine, and made good strong growth during the early spring and summer. This plot was cut on August 14, and gave a yield of 2 tons 680 pounds.

Another plot of red clover was sown this spring on May 25. This plot was also cut on August 14, and gave a yield of 2 tons 320 pounds.

Alfalfa.—A series of experimental plots of alfalfa was sown in 1913. These produced a crop in 1914 and have again produced in 1915. Also other plots were sown in the spring of 1915.

The past season was quite favourable for the growth of alfalfa, although the early part of the season was somewhat dryer than the latter part. This account for the first cutting being the lightest. Two plots have come through two winters and other plots have come through one winter in good condition and have not been winter-killed whatever. The two older plots are Ontario Variegated and Grimm's.

It was intended to secure seed from the older plots this season but the June frost came just when the alfalfa was in full bloom and completely killed the blossoms.

ALFALFA.

Variety.	Sown.	Yield per Acre. First Cut.		Yield per Acre. Second Cut.		Total Yield.	
		Tons.	Lb.	Tons.	Lb.	Tons.	Lb.
Grimm's	1913	2	440	2	740	4	1,180
Ontario Variegated	1913	2	140	1	1,480	3	1,620
Hardy Northern	1914	2	1,220	2	1,230	5	450
Baltic	1914	2	840	1	1,330	5	170
Sand Lucerne	1914	2	920	2	760	4	1,680
Montana	1914	1	1,120	1	640	2	1,760
Ontario Variegated	1915	2	1,510			2	1,510
Hardy Northern	1915	2	1,220			2	1,220
Baltic	1915	2	920			2	920

ANNUAL FORAGE PLANTS.

A plot of one-sixtieth of an acre of Early Fortune millet was sown on April 23 on land that was in hoed crop the previous season. The seed germinated very quickly and by June 14 the growth was fully 10 inches high. It was cut back somewhat by the frost and on account of the very hot and dry weather prevailing for some considerable time after the frost the millet was slow in getting a new start. As a result the yield was quite light. The plot was cut on August 30, and yielded 1 ton 300 pounds per acre.

A plot of one-thirtieth of an acre of fall rye was sown on August 26, 1914, and came through the winter in fine shape. It was fully headed out on June 2 and when cut on July 12 as green feed it was 4 feet 6 inches high. It gave a yield of 3 tons 200 pounds to the acre.

A plot of one-thirtieth of an acre of Dwarf Essex rape was sown on May 4 and was ready to cut as hog feed on July 15. It was fed out at intervals until the whole plot was cut over. By August 15 cutting could start over again. It makes a valuable addition to the hog ration when other feed is scarce.

As a pasture plant it may be eaten off by any kind of live stock, including sheep, cattle and swine. As a forage plant it is quite valuable.

FORT VERMILION.

DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE
DOMINION EXPERIMENTAL FARMS

REPORT

FROM

THE POULTRY DIVISION

For the Year Ending March 31, 1916

PREPARED BY

The Dominion Poultry Husbandman, Ottawa. - - - - - - - F. C. Elford.

Superintendent—

Experimental Station, Charlottetown, P.E.I. - - - - - - J. A. Clark, B.S.A.
Experimental Station, Kentville, N.S. - - - - - - - - W. S. Blair.
Experimental Farm, Nappan, N.S. - - - - - - - - - - W. W. Baird, B.S.A.
Experimental Station, Fredericton, N.B. - - - - - - - W. W. Hubbard.
Experimental Station, Ste. Anne de la Pocatière, Que. - Jos. Bégin.
Experimental Station, Cap Rouge, Que. - - - - - - - - G. A. Langelier.
Experimental Farm, Brandon, Man. - - - - - - - - - W. C. McKillican, B.S.A.
Experimental Farm, Indian Head, Sask. - - - - - - - W. H. Gibson, B.S.A.
Experimental Station, Lethbridge, Alta. - - - - - - - W. H. Fairfield, M.S.
Experimental Station, Lacombe, Alta. - - - - - - - - G. H. Hutton, B.S.A.
Experimental Farm, Agassiz, B.C. - - - - - - - - - - P. H. Moore, B.S.A.
Experimental Station, Invermere, B.C. - - - - - - - - G. E. Parham.

REPORT OF THE POULTRY DIVISION

The Director,
Dominion Experimental Farms,
Ottawa, Ont.

SIR,—I have the honour to transmit herewith the twenty-ninth annual report of the Poultry Division, being the third since its reorganization, at which time I took charge.

THE WORK IN GENERAL.

Though the work of the Poultry Division this year has been one of development rather than of extension, there has been considerable new work and experiments undertaken.

Only two Farms have made a start with poultry during the past year, the efforts having been to complete the equipment on those Farms already handling a poultry department rather than to start work on many new Farms.

Enlisting has affected the work to a considerable extent, five of the Farms having lost their poultrymen in this manner. One of these Farms, Fredericton, has had three or four poultrymen enlist in succession.

THE EXPERIMENTAL WORK.

While most of the experiments already under way in the Division have been continued, considerable new work of an investigational nature has also been started. Among the new experiments might be mentioned: Cost of rearing different breeds; crossing in both hens and geese for table purposes; limited versus farm range for growing turkeys; testing for brooding purposes individual hovers, stove brooders, and pipe brooders; the feeding of pituitary substance to increase egg production, etc.

THE BREEDING STOCK.

At the Central plant, Ottawa, the breeding stock of Barred Plymouth Rocks, Single Comb White Leghorns and White Wyandottes has been increased so that larger numbers of the varieties in which the experimental work is being conducted will be on hand. A number of other breeds are represented, but by only single pens. These are kept to illustrate the various popular breeds and for crossing purposes.

In ducks there are three or four of the best laying and meat breeds that are used to experiment on in the production of eggs and meat. Several varieties of geese are experimented with for meat purposes and the crossing of the wild and domestic is being tested, to better if possible, the table qualities.

During the year turkeys were reared in semi-confinement. The results were very satisfactory; over 47 per cent of those hatched were reared to maturity, and the average dressed weight of a number killed when 7 months' old was over 16 pounds, one weighing as high as 19 pounds 2 ounces. The detail of some of these experiments is contained in this year's report.

BUILDINGS.

On the Central plant four permanent buildings have been erected during the year. A water fowl house on the duck plant, a commercial laying house for one hundred hens, and two farmer's poultry houses holding one hundred hens each. These latter two houses are similar to the farmer's poultry houses that have been erected on the

branch Farms, and which have proved quite satisfactory. A full description of the farmer's poultry house is included in this report.

The buildings and equipment have been completed at a number of the Farms that have prior to this year included poultry. At Agassiz, B.C., an administration building was constructed, a permanent poultry house at Indian Head, Sask., an administration building at Brandon, Man. At Cap Rouge, Que., one permanent poultry house and a pipe brooder house have been erected, and at Charlottetown an administration building and one farmer's poultry house were added to the plant.

POULTRY AT TWO MORE FARMS.

The two new farms that have started poultry are Ste. Anne de la Pocatière, Que., and Sidney, B.C. At Ste. Anne an administration building, one farmer's poultry house and several colony houses were built, one hundred Wyandotte pullets installed, and hatching and rearing will be conducted there this spring. At Sidney an administration building, a brooder house, and several colony houses were put up during the fall and winter. No hatching will be done there this spring, but orders are placed for one thousand day-old chicks to be delivered in the spring.

EXTENSION WORK.

Survey work among the farmers was conducted with two groups of farms this year. One of these groups consisting of thirty-five farmers in the vicinity of Cap Rouge Experimental Station, was visited by Mr. Victor Fortier, the other group of about twenty farmers, at Merrickville, Ont., was visited by Mr. George Robertson. The aim of this work is to obtain data of actual conditions as they are on the farms, and to so advise the farmers that they will adopt business methods in their poultry operations. This work so far has shown that the average condition of the farmer's poultry plant is by no means ideal, but it also demonstrates that the average farmer is willing to adopt methods that will ensure for him better returns at less cost.

The demand for lectures and judging continues. It has been impossible for Mr. Robertson, owing to the nature of his work here, to comply with all the requests for judging or speaking. Mr. Fortier has been able to accede to some of the requests received, he having given sixty-two illustrated lectures in the province of Quebec, he has also judged at fifteen exhibitions and has been absent at work of this nature from the office for 129 days during the year.

ACKNOWLEDGMENTS.

I wish to acknowledge the co-operation of various members of the Experimental Farm staff and of Dr. Charles H. Higgins, Dominion Pathologist, and his assistant, Dr. Wickware, who have always been willing to lend assistance.

For attention to the survey work I am indebted to Mr. Victor Fortier and to Mr. George Robertson, who visited the group of farms as near once a month as possible. To them also credit is due for the report of this work that is herein included.

To Mr. Walter Scott credit belongs for conducting the details of experiments carried on at the Central plant, he keeping records and arranging these as they appear in this report.

The various Superintendents have been very helpful and in some cases enthusiastic in the poultry work and to them and the poultrymen in charge credit is due for the valuable work done on the branch Farms and the reports contained herein.

I have the honour to be, sir,

Your obedient servant,

F. C. ELFORD,

Dominion Poultry Husbandman.

OTTAWA, March 31, 1916.

SESSIONAL PAPER No. 16

CENTRAL EXPERIMENTAL FARM, OTTAWA.

REPORT OF THE DOMINION POULTRY HUSBANDMAN, F. C. ELFORD.

INTRODUCTION.

Canada is again exporting poultry and eggs, and there seems no reason why she should not continue to do so in larger and larger quantities until she supplies a good proportion of what Great Britain has to import.

Poultry production in Canada for some time did not keep pace with the demand. For several years prior to 1909, this country was an exporting country, but from 1909 to 1914 Canada not only had nothing to export, but actually had to import both eggs and dressed poultry in order to meet the home demand. During the year 1914 a small surplus was produced and exported. In 1915, following the "Patriotic Campaign for Greater Production," there was a larger surplus produced, and the exports exceeded the imports in value by $1,842,858. For the fiscal year April 1, 1915, to March 31, 1916, the imports for home consumption amounted to 3,783,952 dozens of eggs, valued at $786,100, and poultry to the value of $55,051, making a total import value of $841,151. During the same twelve months there were exported 7,898,322 dozens of eggs valued at $2,273,412, live poultry worth $298,719, and dressed poultry valued at $111,878, making a total export of $2,684,009. Besides the imports for home consumption there was a slight amount imported that was immediately exported, but this amount is not included in the figures given above.

Once again, therefore, Canada is in the exporting class and with the demand there is for Canadian poultry products in Great Britain, and the request that Canadians help feed the Empire, those who can should begin to keep more and better poultry.

BREEDING STOCK KEPT BY THE POULTRY DIVISION, EXPERIMENTAL FARM SYSTEM, ON HAND JAN. 1, 1916.

	—												Ducks.							Geese.				Guineas.	Turkeys—	Pigeons—	Total.
	Barred P. Rocks.	White P. Rocks.	White Wyandottes.	Minorcas.	White Orpingtons.	Buff Orpingtons.	Black Orpingtons.	R. I. Reds.	White Leghorns.	Brown Leghorns.	Sussex.	A. O. V.	Aylesbury.	Rouen.	Pekin.	Indian Runner.	Cayuga.	Wild.	Call.	African.	Toulouse.	Embden.	Wild.	Pearl.	Bronze.	W. P. Rock	
Ottawa, Ont.	193	52	79	9	25	18	4	8	328	5		25	3	6	35	25	14	2	1	16	1	4	3		38		896
Agassiz, B.C.	267								244						33										36	582
Invermere, B.C.	80				4				69		9														10	172
Lacombe, Alta.	151		111		82			25	116						15						8				10	518
Lethbridge, Alta.	172								106				5													283
Brandon, Man.	87		77																							164
Indian Head, Sask.	83		149																							232
Charlottetown, P.E.I.	64								156																	220
Nappan, N.S.	100				49				45																	194
Kentville, N.S.	151		51					71																		273
Fredericton, N.B.	82		84					127	85			58														436
Ste. Anne de la Pocatiere, P.Q.			100																							100
Cap Rouge, Que.	229																									229
Total	1,659	52	651	9	160	18	4	231	1,149	5	9	83	8	6	83	25	14	2	1	16	9	4	3	4	58	36	4,299

OTTAWA.

PRICES RECEIVED FOR EGGS AT THE VARIOUS FARMS OF THE EXPERIMENTAL FARM SYSTEM.

Farm.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Average.	Average for 1914.
	cts.	cts.	cts.	cts.	cts.	cts.	cts.	cts.	cts.	cts.	cts.	cts.	cts.	cts.
Agassiz, B.C.	35	35	25	25	25	25	30	35	40	45	50	50	35	35½
Invermere, B.C.	60	54	30	25	25	25	25	25	30	40	45	45	35¾	48
Lacombe, Alta.	50	45	25	20	18	20	20	20	25	35	45	45	30⅔	25
Lethbridge, Alta.	50	42	30	20	20	20	20	20	25	30	35	46	30	....
Indian Head, Sask.	30	30	20	15	15	15	15	15	25	30	30	35	23	27
Brandon, Man.	30	30	30	15	15	15	15	15	15	15	15	30	20	21
Cap Rouge, Que.	50	33	25	23	20	20	22	25	29	36	40	47	31	...
Fredericton, N.B.	35	35	30	25	25	25	25	25	25	30	35	35	29	30
Nappan, N.S.	25	25	25	25	25	25	25	25	25	25	30	30	26	25
Kentville, N.S.	30	30	25	20	18	18	20	22	20	25	30	35	24½	22
Charlottetown, P.E.I.	33	26	18	18	20	20	19	22	25	27	26	35	24	25
Average for all Branch Farms	39	35	25½	21	20½	20½	21½	22½	26	31	34½	39½	28	29
Average for Western Farms	42½	39	22	24	23½	24	25	22	27	32½	37	42	29	31
Average for B.C. Farms	47½	44½	27½	25	25	25	27½	30	35	42½	47½	47½	35½	41
Average for Prairie Farms	40	37	26	17½	17	17½	17½	17½	22½	27½	31	39	26	25
Average for Maritime Farms	31	29	24½	22	22	22	22¼	23½	23¾	26¾	30¼	33¾	25¾	25½
Ottawa	50	50	35	30	30	30	30	35	35	35	50	50	41	36
Average for all Farms	44½	42½	30	25½	25½	25½	25½	29	30½	33	42	45	34½	34½

These prices are not to be taken as the actual market prices as they may be somewhat higher owing to the better care taken with the eggs. The prices, however, indicate the relative value of new laid eggs at the various places throughout the Dominion.

The Ottawa prices range the highest but at the Central Farm the market quotations are not adhered to as closely as at the branch farms. The price here did not go above 50 cents, though prices in the city of Ottawa were much higher during the season of scarcity, nor did the price go below 30 cents, though new-laid eggs could be bought for a few cents less in the spring.

Compared with the year 1914 the average price is the same; the British Columbia prices are lower and Ottawa higher.

The lowest months were April, May, June, and July, and the highest December.

NEW HOUSES.

Three new hen houses and one duck house were built at the Central plant this year, and because of the satisfactory results obtained from two of these poultry houses this winter and for several winters at some of the branch Farms, we give the construction in detail.

The third hen house built has not been as satisfactory as it might, so no plan of it will be given until further experiments are made.

There may be no one house that is universally satisfactory to the whole of Canada. The climate and other conditions vary so much between the Atlantic and the Pacific, between southern Ontario and northern Alberta and Saskatchewan, that necessarily there is some difference in what is required of a poultry house. It is, therefore, more a question of the principles involved in the general construction of poultry houses rather than particular plans or hard and fast rules.

On the other hand, there are some houses that seem to qualify as generally suitable for certain conditions. Of this class are the two types of the Farmer's Poultry House.

THE FARMER'S POULTRY HOUSE.

This house holds one hundred hens, is 16 feet by 32 feet and is divided into two pens, each 16 feet square. The house has given satisfactory results on the Experimental Farms system for several years. It has been used in every province in the Dominion, and may be built with a single roof or a double roof and a straw loft. In the drier sections of Canada the single roof is recommended, while for the more humid parts the double roof and the straw loft type is to be preferred.

At Ottawa there were used this winter the two types of this house. Both gave satisfactory results, with a slight preference for the straw loft, because of its extreme dryness. There was no moisture in the litter or adhering to the walls of this house, though on cold nights it registered eight to ten degrees colder than in the house with a single roof and no straw loft.

The single roof house used here has the under edge of the rafters stripped as far as the roosts and filled in with straw between. If this type of house should be damp it is a good plan to tack slats or wire underneath the entire length of the rafters and fill in with straw.

Both houses are built without drop boards, the roosts being hinged to the wall. The nests are contained in a cabinet along the outside walls. Outside of this they are constructed according to specifications that are given here.

The plans and specifications here given are followed fairly closely in the building of these houses in all the provinces. They have given such general satisfaction in every province that we recommend them for general farm use. Where it is desirable to house more than one hundred hens in one building the same plan can be extended indefinitely. Should cement floors not be preferred, any other floor should prove satisfactory, but it is a cement slab that acts as foundation and floor that is described here.

SPECIFICATIONS.

The floor merely a slab.—No trenches are dug for the foundations, the floor is laid upon the ground, the top of the floor being from 10 to 15 inches above the surrounding level.

Making the frame of the concrete.—Take enough boards to reach around the outside of the building. Boards 1 inch thick will do, and as wide as the height of the floor is to be above the surface. Set these boards on edge and stake them in position so that the inside of the boards is the size of the house. Level and nail lightly to the top edge a 6-inch board so that it will project in over the floor. In this 6-inch strip bore holes every 6 to 10 feet to take a $\frac{5}{8}$-inch bolt. These bolts are for the purpose of holding the sill and should extend above the finished floor far enough to go through and screw down a 2 by 4 scantling. When the heads of these bolts become secured in the concrete, remove the 6-inch boards that hold them in position so that the straight edge can be used to level the surface of the floor.

Filling in the stone and cement.—When the frame is levelled and secured, the stone may be filled in. This could have been dumped on the ground before with less trouble except that it might interfere with the levelling of the boards. Stone, brick, plaster, or anything of a like nature should be used to fill up to about 2 inches of the top of the floor. There should be several inches left around on the inside of the frame to allow for concrete being placed there to form the wall. Then fill in with the concrete to the edges of the frame and within three-quarters or 1 inch of the

finished floor surface. The finishing coat of cement is then put in, levelled with the straight edge of the top of the frame or retaining boards, and smoothed off with a trowel.

Portions of sand, stone and cement.—If broken stone and sand are used the mixture for the coarse concrete should be one bag of cement to two barrows of sand and four barrows of broken stone (about an inch and a half diameter). The sand and cement are mixed together, then they are thoroughly mixed with the crushed stone, the whole wet with water, mixed again and used at once.

The finishing coat is composed of one bag of cement to one barrow of sand and three barrows of fine crushed stone, mixed as described above, and used at once.

If gravel is used, make the rough coat with one bag of cement to six barrows unsifted gravel, not too coarse; and for the finishing coat use one bag of cement to two barrows of sand.

Walls.—The exterior walls consist of 2 by 4 studding, at centres shown on plans resting on a 2 by 4 sill, and supporting a plate of two 2 by 4. These studs are covered outside with one-ply of tarred paper and 1-inch T. & G. boarding or 1-inch boards and battens.

On inside, behind and around the ends of the roosts the studding is covered with tarred paper then with 1-inch T. & G. boarding. Inside partitions are built of studding, covered with wire mesh to within 2½ feet of floor, rest of partition 1-inch boarding.

Roof.—The rafters are 2 by 4 at 20-inch centres, resting on the plate two 2 by 4. On these rafters, lay one thickness of 1-inch sheeting and ready roofing or, if preferred, tarred paper and good cedar shingles, laid 4½ inches to the weather.

Windows.—Windows are built between studs as shown, and fitted with frames for glass, or cotton where indicated. All sashes to be hinged, and swing in. Outside of all window openings is covered with 1-inch mesh poultry netting.

Doors.—The outside door frames are of 2-inch stuff, rabbetted for 1-inch battened doors. Any inside doors are made to match the partition and hung so as to swing both ways.

List of Material Required for Farm Poultry House.

Shed Roof.

	Board Feet.
Studs, 2″ x 4″, 218 lineal feet	146
Plate, 2 pieces, 32′ x 2″ x 4″, 64 lineal feet	43
Sill, 2 pieces, 32′ x 2″ x 4″ / 2 ″ 16′ x 2″ x 4″ } 96 lineal feet	65
Rafters, 17 pieces, 16′ x 2″ x 4″, 280·5 lineal feet	187
Wall boarding (T. and G.) 781 square feet (+10%)	860
Roof boarding (1″), 612 square feet	612

Shingles, 612 square feet.
2 windows, 5′ x 5′ and frames (cotton and wire mesh).
2 windows, 3½′ x 5′ and frames (cotton and wire mesh)
4 windows, 3′ x 5′ and frames (glass and wire mesh).
2 windows, 3′ x 3½′ and frames (glass only).
2 doors, 2′ 9″ x 6′.
Hardware (hinges, nails, etc.), paint (3 coats).

Floor.

For 2″ concrete floor—
5 barrels cement.
1½ cubic yards sand.
2¾ cubic yards gravel.

List of Material Required for Farmer's Poultry House.

Double Roof and Straw Loft.

	Board Feet.
Studs, 2″ x 4″, 262½ lineal feet	175·5
Plate, 2 pieces, 32′ x 2″ x 4″, 64 lineal feet	43
Sill, 2 pieces, 32′ x 2″ x 4″ / 2 " 16′ x 2″ x 4″ } 96 lineal feet	65
Rafters, 24 pieces, 10′ x 2″ x 4″, 340 lineal feet	227
Roof boards, 680 square feet	680
Shingles, 680 square feet.	
Wall boarding (T. and G.), 800 square feet (+ 10%)	880
Ceiling joists, 17 pieces, 16′ x 2″ x 4″, 272 lineal feet	187
Ceiling boards, 68 pieces, 32′ x 1″ x 3″, 2,176 lineal feet	384
2 windows, 5′ x 5′ and frames (cotton and wire mesh).	
2 windows, 3½′ x 5′ and frames (cotton and wire mesh).	
4 windows, 3′ x 5′ and frames (glass and wire mesh).	
2 windows, 3′ x 3½′ and frames (glass only).	
2 doors, 2′ x 9″ x 6′.	
2 lowered windows, 2″ x 2½′.	
Hardware (hinges, nails, etc.), paint (3 coats).	

Floor.

For 2″ concrete floor—
- 5 barrels cement.
- 1½ cubic yards sand.
- 2¾ cubic yards gravel.

REARING TURKEYS.

This year the object of the work in turkeys was to see what degree of success could be obtained in the rearing of turkeys when confined to yards and not allowed free range.

It was not expected that better results by this system would be obtainable, but as this is the method that has of necessity been adopted in all the experimental work conducted here by the Biological Laboratory and by this Division, it was decided to see what could be done when the birds were not being used for disease experiments.

Turkeys have been reared on the Central Experimental Farm for a number of years in connection with the Black Head experiments conducted by the Biological Laboratory. Two years ago the Poultry Division assumed the practical management of this work since which time it has co-operated with the Laboratory in the turkey investigations. The plots used by the Biological Laboratory for runs for the Black Head-infected stock are the only area that has been available for the work up to the present. The area being small—about one acre—the rearing experiments necessarily have been conducted in confinement and the fact that turkeys, healthy and otherwise, have been yarded on the same plots for years makes it difficult to bring as large a percentage through as might otherwise be done.

From experiments prior to this year, the results would indicate that if sanitary conditions are maintained in the breeding quarters, the eggs hatched and the poults reared away from the adult turkeys, even though in confinement, a certain degree of success might be assured.

To ensure the isolation of the egg and poult from the mother bird, artificial incubation and brooding were adopted. The chicks were hatched in a mammoth incubator, brooded under electric hovers placed in colony houses, and reared in plots one-quarter of an acre in size. In each of these plots 13 young poults were placed.

Thirty-nine poults were taken for this year's experiments. They were hatched from eggs laid by a flock of birds, some of which were chronic black-head carriers, others were what were left from a flock that had been affected with black-head the year before. The parent stock therefore could not be considered free from disease.

Ottawa.

The yards in which these poults were placed were one-quarter acre plots of mixed grass, having some alfalfa; they were mowed twice during the year, and produced fairly heavy crops of hay each time. The yards had similar treatment previous to this except that No. 1 had the breeding stock upon it until the eggs were laid from which the poults were hatched. No. 2 had no turkeys on since the summer before and No. 3 had not been used for a turkey run for two years. All yards, as already noted, were growing a good crop of hay and the houses underwent a thorough disinfecting before the poults were put in.

The results of the incubation of the turkey eggs were fair, a record of the fertility and hatching is given in the following table.

No. of Record—37. HATCHING RECORD OF TURKEY EGGS. Incubator—Candee (1).

Date set—April 18, 1915. *Experimental Farms System, Ottawa.* Date hatched—May 16.

No. of Pen	Breed.	Total No. Eggs Set.	First Test.			Second Test.		Hatched.	Cripples.	Put in Brooder.	Per cent Fertile.	Per cent Fertile Hatched.	Per cent Total Eggs Hatched.	Remarks.
			Infertile.	Blood Rings.	Left in.	Dead Germs.	Left in.							
1	Bronze.....	103	23	.....	80	10	70	44	5	39	77·6	55	42·7	

THE POULTS WERE FED AS FOLLLOWS.

The attendant having charge of the young poults had been fairly successful previously in raising young stock of his own, so that he was given a free hand to use any method or ration he considered best.

The following was practically the method and ration he adopted, with the result mentioned:—

Ration.—No food for 48 to 72 hours from the time the chick leaves the shell.

Bran or shorts mixed with skimmed milk and plenty of chopped dandelion leaves or onion tops. After 10 days, besides the above, one or two feeds of cracked grain such as corn, wheat and oats. Occasionally a little rolled oats (fed dry). Green feed fed liberally if the range did not provide lots of clover.

Good sharp grit and oyster shell always accessible.

There is no hard and fast rule for successfully raising young stock, as turkeys on free range or under different conditions would perhaps thrive better with a different ration, but the result, taking into consideration the diseased nature of the parent stock in most instances and the small area allotted for range, shows that a fair percentage of turkeys can be reared to a good weight in confinement.

The rearing results may be shown as follows:—

Number placed in brooder May 18		39
Stolen August 7	5	
Died to August 7 (Enterohepatitis)	18	
		23
Carried to maturity		16

Eliminating the five healthy birds that were stolen August 7 leaves 34 from which 16 were reared to maturity which is 47 per cent.

On December 15 the males that were to be kept for breeding were selected, and eight of the others, males and females killed, drawn and examined for presence of black head. These were diagnosed by the Biological Laboratory, but no lesions of *Entero Hepatitis* were found.

The weights of the eight birds dressed (that is bled and with the feathers off) and drawn were taken and given individually in the following table:—

	Dressed Weight.		Drawn Weight.	
	Lb.	Oz.	Lb.	Oz.
	18	5	14	5
	16	8	12	6
	16	8	12	10
	19	2	13	7
	17	13	13	12
	13	5	10	0
	17	8	13	12
	15	12	11	12
Average	16	13	12	12

SHIPPING PARTIALLY HATCHED EGGS.

In the shipping of breeding eggs, considerable expense and inconvenience are occasioned by the fact that too often more or less of the eggs prove infertile. A large per cent of infertility is always a disappointment to the receiver and often a considerable loss, in that by the time the infertile eggs are duplicated the season may be too far advanced. There is also the extra expense in express or postage in sending eggs that have to be replaced later at another cost for transportation.

OTTAWA.

To see if there was any encouragement to incubate eggs enough to ensure fertility before shipping a small experiment has been conducted here in conjunction with Professor Herner of the Manitoba Agricultural College, Winnipeg. On June 10, 1915, one hundred and fifty White Leghorn eggs were set here in a small incubator. Beginning with the fourth day of incubation fifteen fertile eggs were taken out of the machine, wrapped carefully in paper and packed in a one-setting hatching egg box, and sent to Winnipeg. Five shipments were made with eggs that had been four, six nine, eleven, and twelve days in the incubator. The table below gives the detail of these five shipments :—

TABLE showing detail of shipping partially hatched eggs.

Fertile. eggs shipped.	Date Shipped.		Condition Received.
15	4th day.....	Parcel post.	Dead.
15	6th "	Parcel post.	"
15	9th "	Express.	"
15	11th "	Parcel post.	"
15	12th "	Parcel post.	"

Forty fertile eggs were left in the incubator, from which 35 good healthy chicks were hatched.

When the eggs arrived at their destination there was found to be no life in any of them and therefore, as far as this experiment went, the shipping of partially hatched eggs was not a success.

TURNING *vs.* SHUFFLING EGGS.

The advantage of turning eggs half over individually as compared with shuffling them in the usual manner at the time of cooling was tested, and though hardly practical on a large number of eggs owing to the time involved, the following table points to some advantage in favour of those eggs that were turned individually.

Where there are only one or two incubators in use it would perhaps be preferable.

EXPERIMENT IN ARTIFICIAL INCUBATION.—EGGS TURNED INDIVIDUALLY vs. SHUFFLED.

Eggs set.	Breed.	Average Temperature.				First Test.		Second Test.		Total Hatched.	Per cent Fertiles.	Per cent Fertiles Hatched.	Per cent Total Hatched.	Remarks.
		Room.		Incubator.										
		A.M.	P.M.	A.M.	P.M.	Infer-tiles.	Left in.	Dead germs.	Left in.					
100	W. Leghorn.....	71	67	103·4	103·2	13	87	13	74	43	87	49·4	43·0	Shuffled.
100	W. Leghorn.....	.....	.....	103·4	103·2	11	89	9	80	63	·89	70·7	63·0	Turned individually

The eggs that were turned individually showed 20 per cent better result than those that were shuffled.

OTTAWA.

PEN RECORDS.

A complete record of loss or gain on most pens at the Central and branch Farms is kept by means of the table shown below.

When the fowl have free range for at least six months of the year the cost of feeding is considerably reduced. In the record for the month of April, pen 22, the saving in cost of production is shown to be considerable. This is principally due to the eliminating of the green bone that has been fed during the winter months at a cost of 3 cents per pound, the most expensive item in the winter feed bill, but unnecessary in the summer, when the birds are on range or given large yards and the benefit of their natural feed in the shape of worms, insects, and green feed.

The two examples herewith are given as a comparison between the light Mediterranean variety, viz., White Leghorns, and the heavy American breed, the Barred Plymouth Rocks.

PEN RECORD for Six Months.

Poultry Division.—Pen No. 22. Number in pen, 100. Experimental Farm.—Variety, White Leghorn, year 1915-16.

Month.	Number of Eggs laid.	Average price per dozen.	Total value of Eggs.	Value of feed consumed.	Loss or Gain per Pen.	Loss or Gain per Hen.	Cost of one doz.	Remarks.
			$ cts.	$ cts.	$ cts.	cts.	cts.	
Nov....	148	50	6 17	7 93	− 1 76	− 1·7	64·3	
Dec....	663	50	25 12	9 10	+ 16 2	+ 16·2	18·1	
Jan....	627	50	26 12	10 86	+ 15 26	+ 15·26	20·7	
Feb....	602	50	25 08	12 95	+ 12 13	+ 12·13	24·1	
March..	1,245	35	36 32	10 09	+ 26 23	+ 26·23	10·4	
April....	1,541	30	38 52	7 49	+ 31 03	+ 31·03	5·8	

Average cost for feed per hen 58½ cents for 6 months.
" cost to produce one dozen eggs, 6 winter months 23·9 cents.
" price one dozen eggs.. .. .. 44·1 cents.
23·9 "

Average margin on each dozen.. .. .. 20·2 "
" profit per hen for 6 months.. .. .. 0·99 "

PEN RECORD for Six Months.

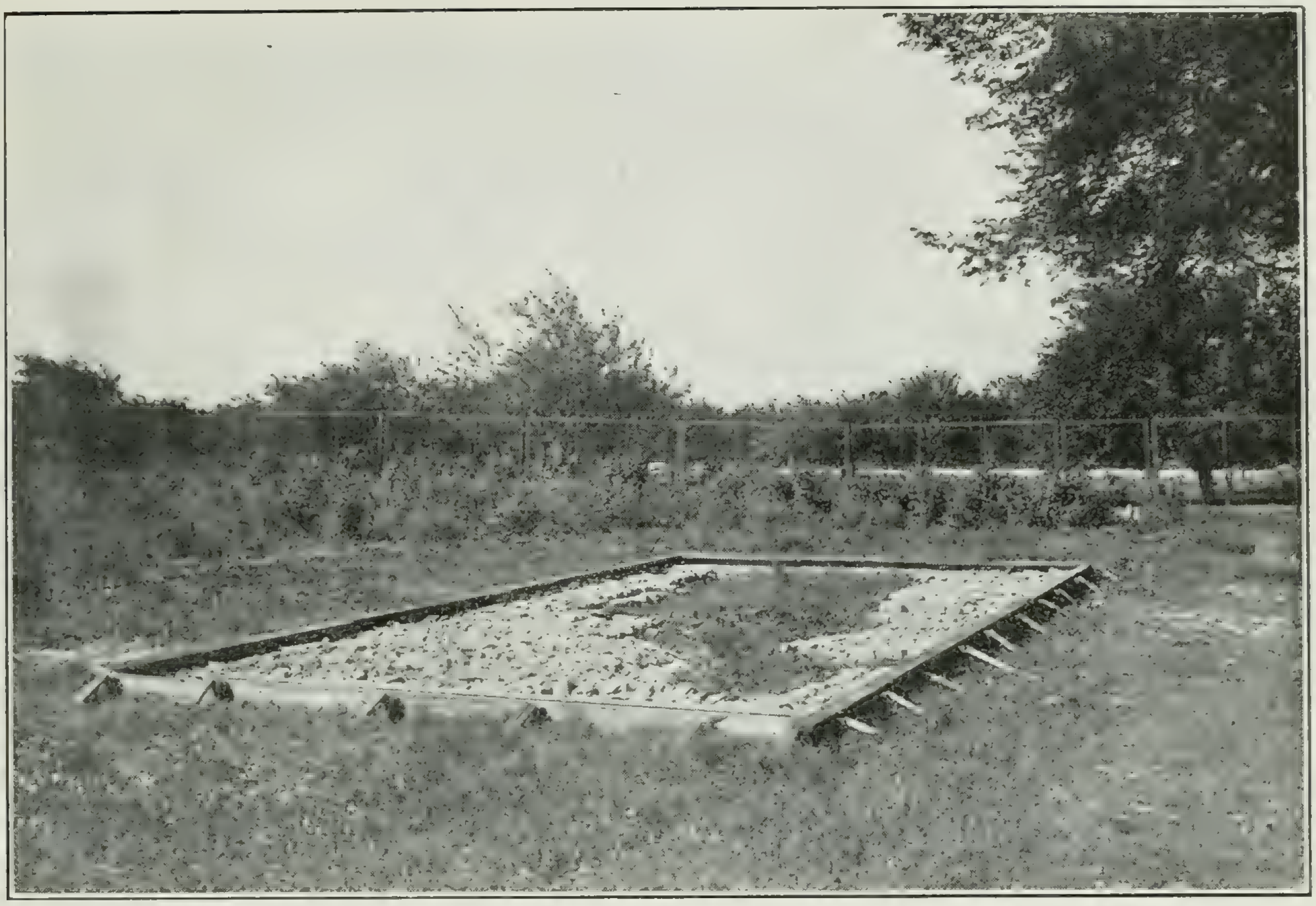
Poultry Division.—Pen No. 7. Number in pen, 9. Experimental Farm.—Variety, Barred Plymouth Rock, year 1915-16.

Month.	Number of Eggs laid.	Average price per dozen.	Total value of Eggs.	Value of feed consumed.	Loss or Gain per Pen.	Loss or Gain per Hen.	Cost of one doz.	Remarks.
			$ cts.	$ cts.	$ cts.	cts.	cts.	
Nov.....	77	50	3 21	1 04	+ 2 17	+ 24·1	16	
Dec.....	76	50	3 16	1 16	+ 2 0	+ 22·2	18·3	
Jan.....	102	50	4 25	1 19	+ 3 06	+ 34	14	
Feb.....	112	50	4 67	1 54	+ 3 13	+ 34	16·5	
March....	86	35	2 51	1 64	+ 0 87	+ 9·6	22·9	
April.....	118	30	2 95	1 74	+ 1 21	+ 13·4	17·7	

Average cost for feed per hen 92 cents for 6 months.
" " to produce one dozen eggs, 6 winter months 17·5 cents.
" price one dozen eggs.. .. .. 44·1 cents.
17·5 "

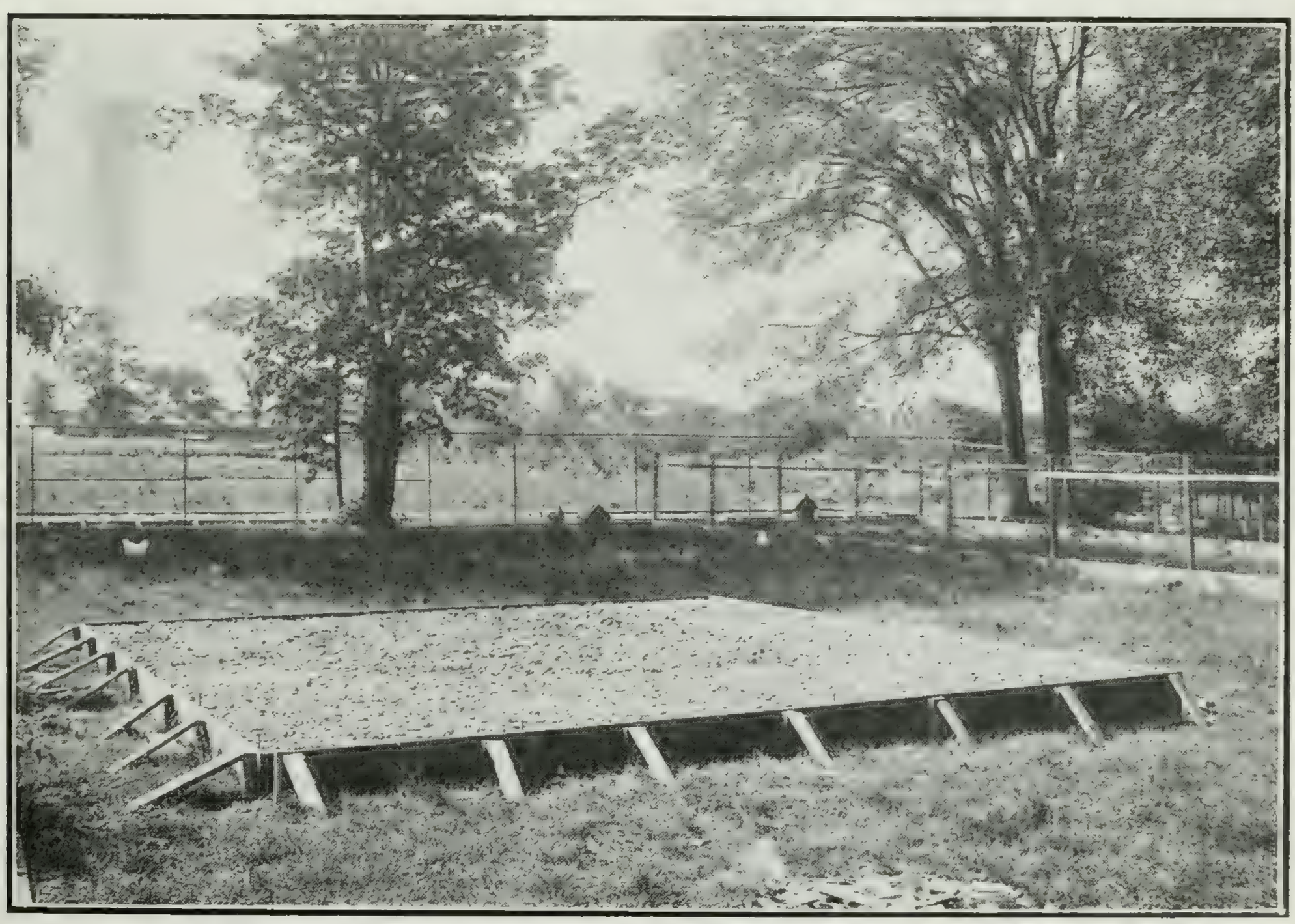
Average margin on each dozen.. .. .. 26·6 "
" profit per hen for 6 months.. .. .. 1·38 "

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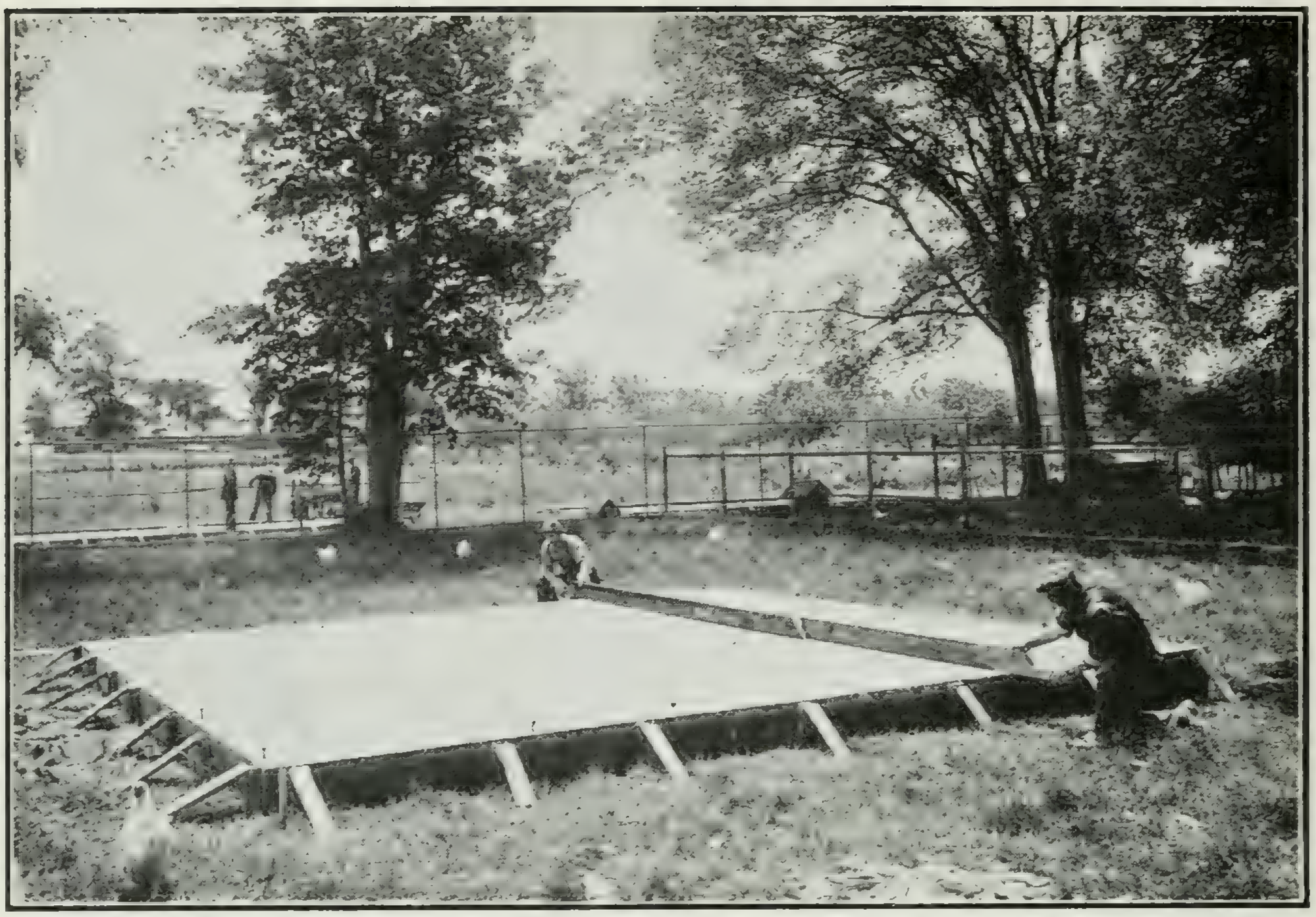
The Concrete Frame and Filling.

The one-inch board staked in position, leveled, the 6″ board to hold the bolts nailed on and part of the filling material put in place. Note that in the frame the grass appears in the middle showing that the floor is laid upon the very top of the ground-

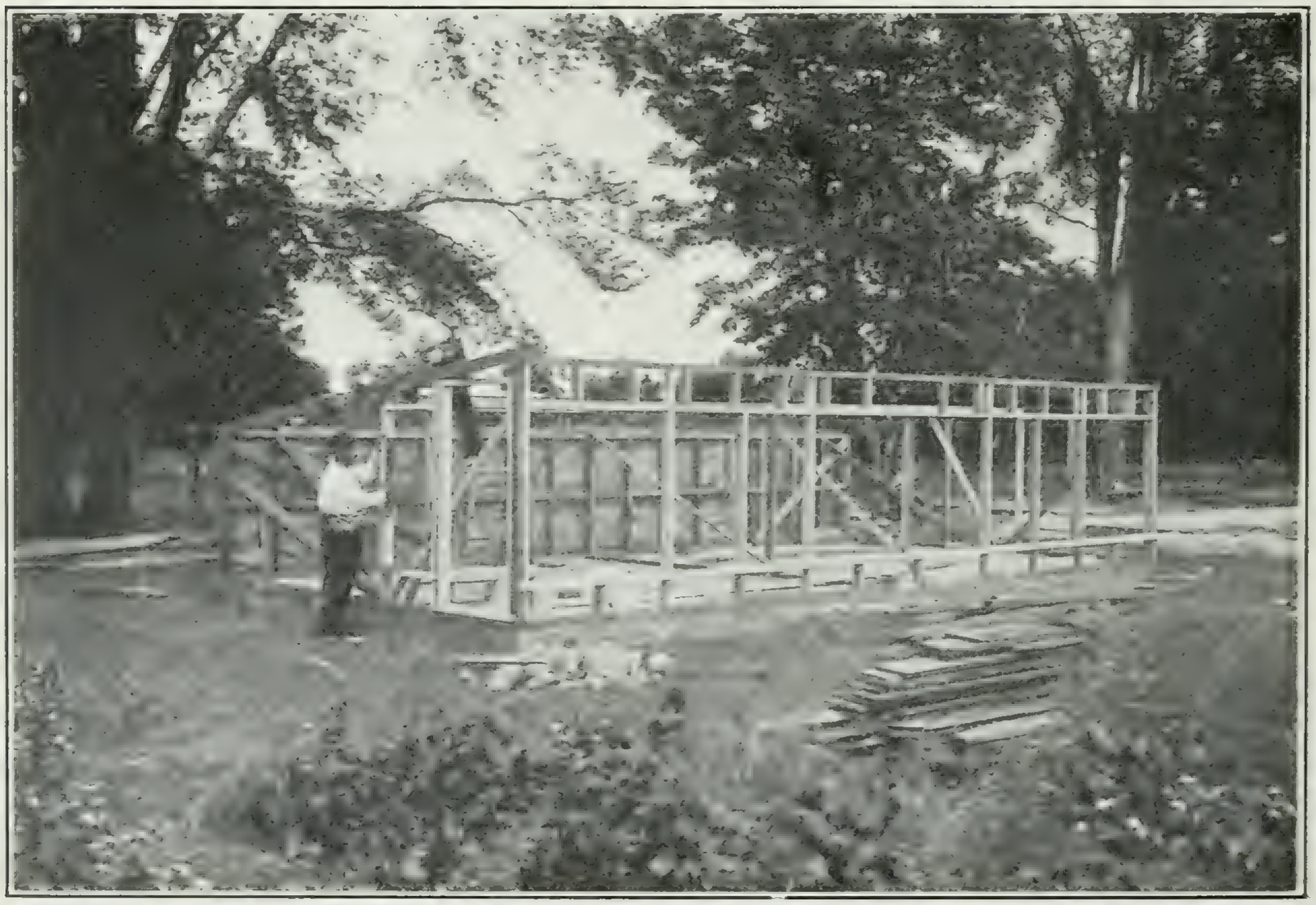


The rough concrete. The coarse part of the concrete filled in on the stone and the 6-inch board removed leaving the bolts sticking out of the concrete.

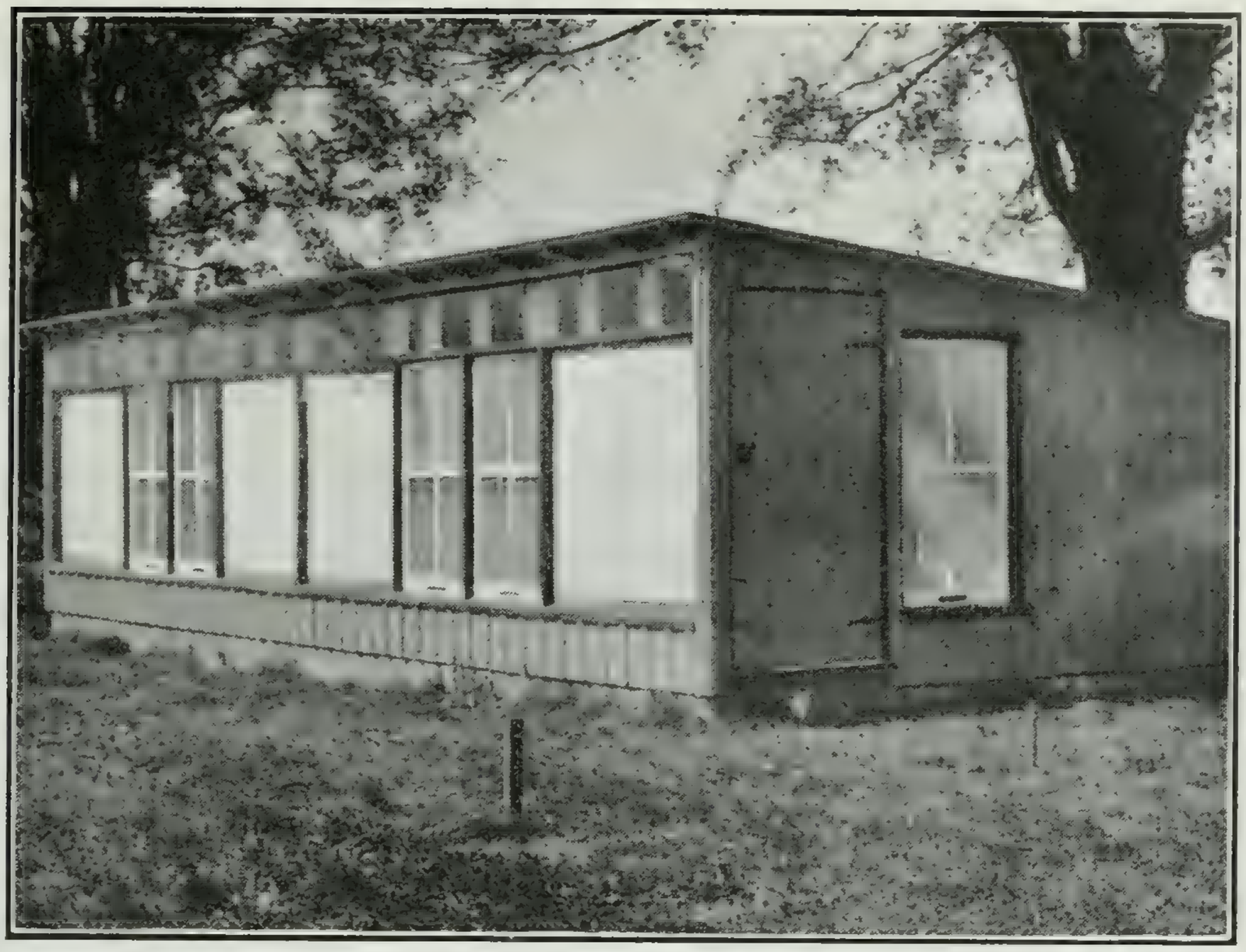
16—1916—89a



The straight edge at work. The fine concrete filled in up to the height of the frame and levelled off with the straight edge. This surface can be trowelled off to make a smooth finish. When the cement is set the retaining boards are removed and the edges of the floor wall plastered up.



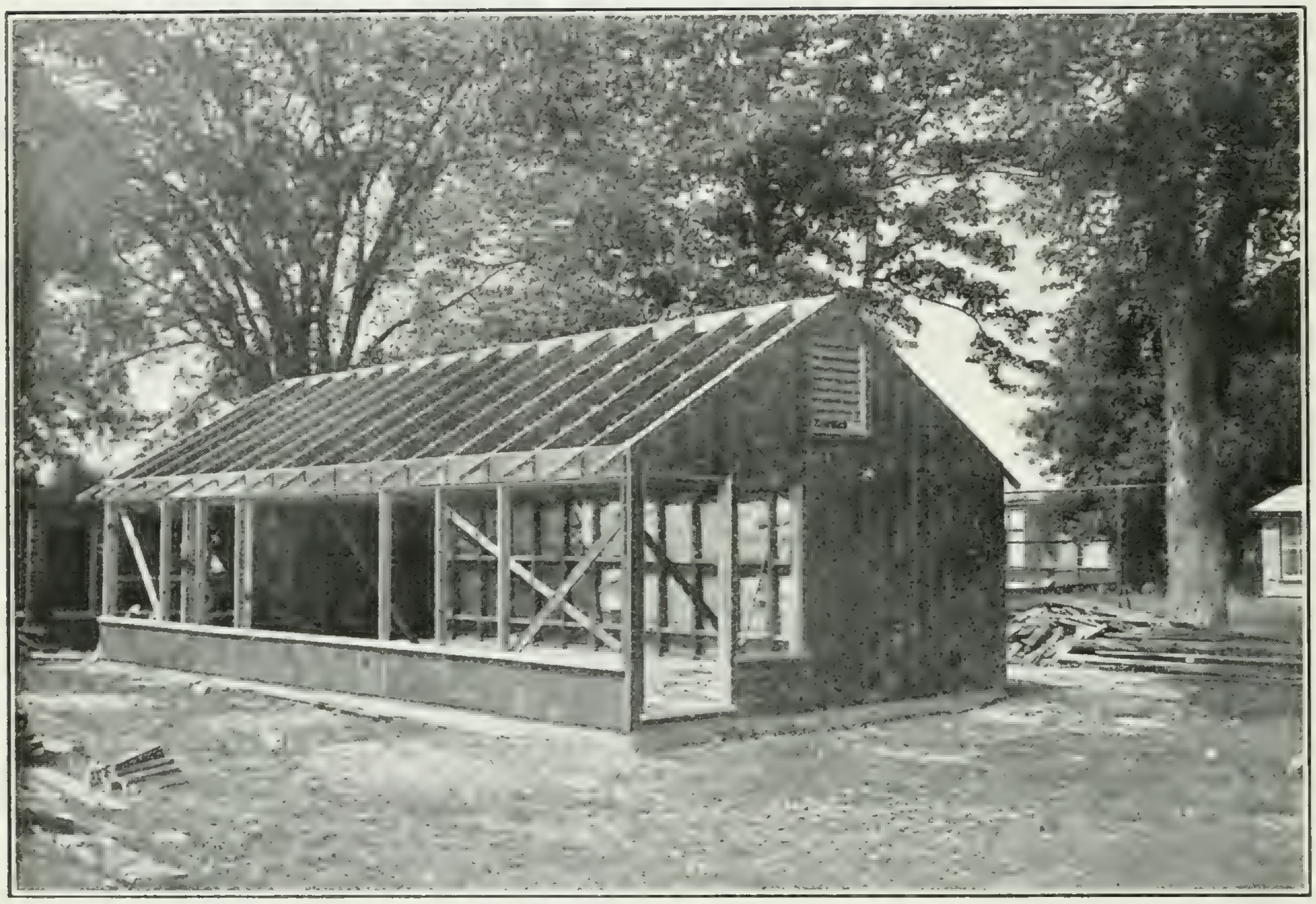
Frame of shed roof house.
In some of these houses the windows have gone right to the top leaving more space below.



The Farmers' Poultry House. The shed roof type completed except that the openings in the front near the roof are covered with cotton.



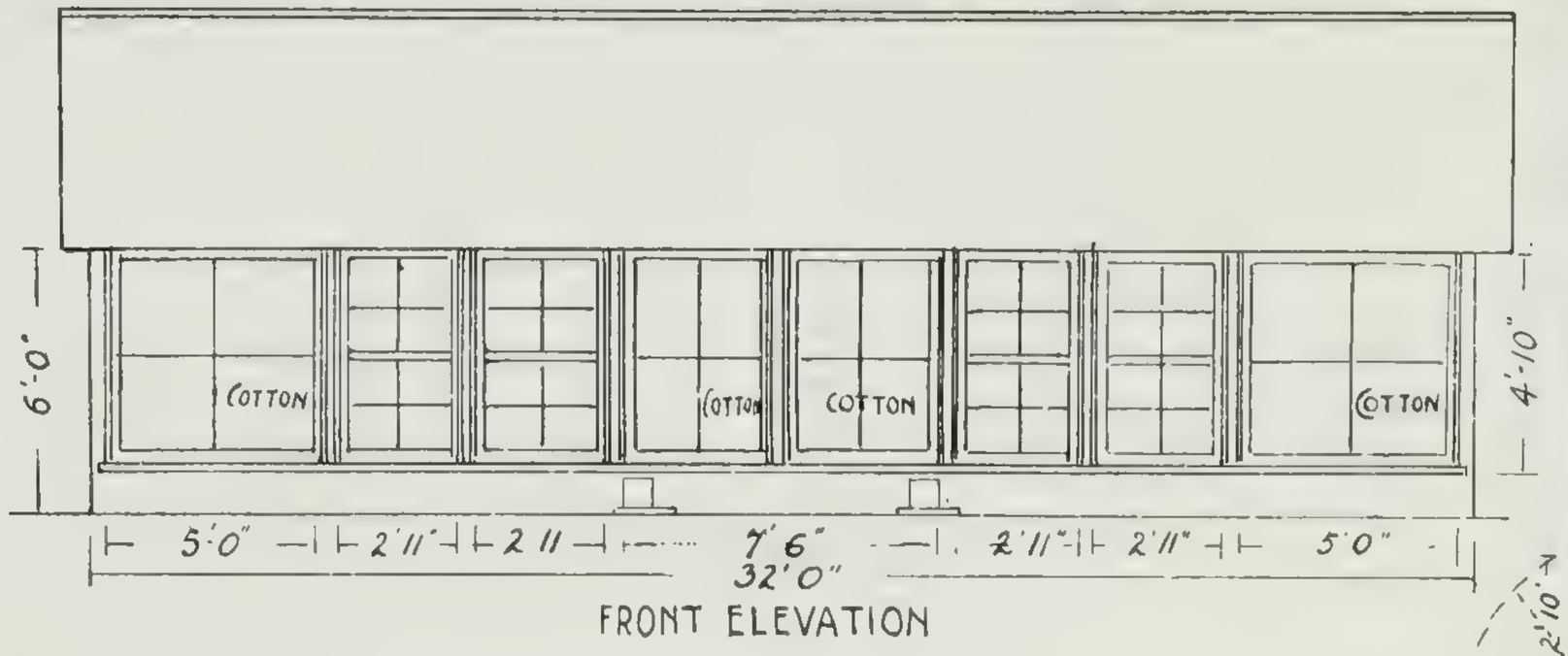
The Farmers' Poultry House. The straw loft type completed and ready for the yard and pullets.



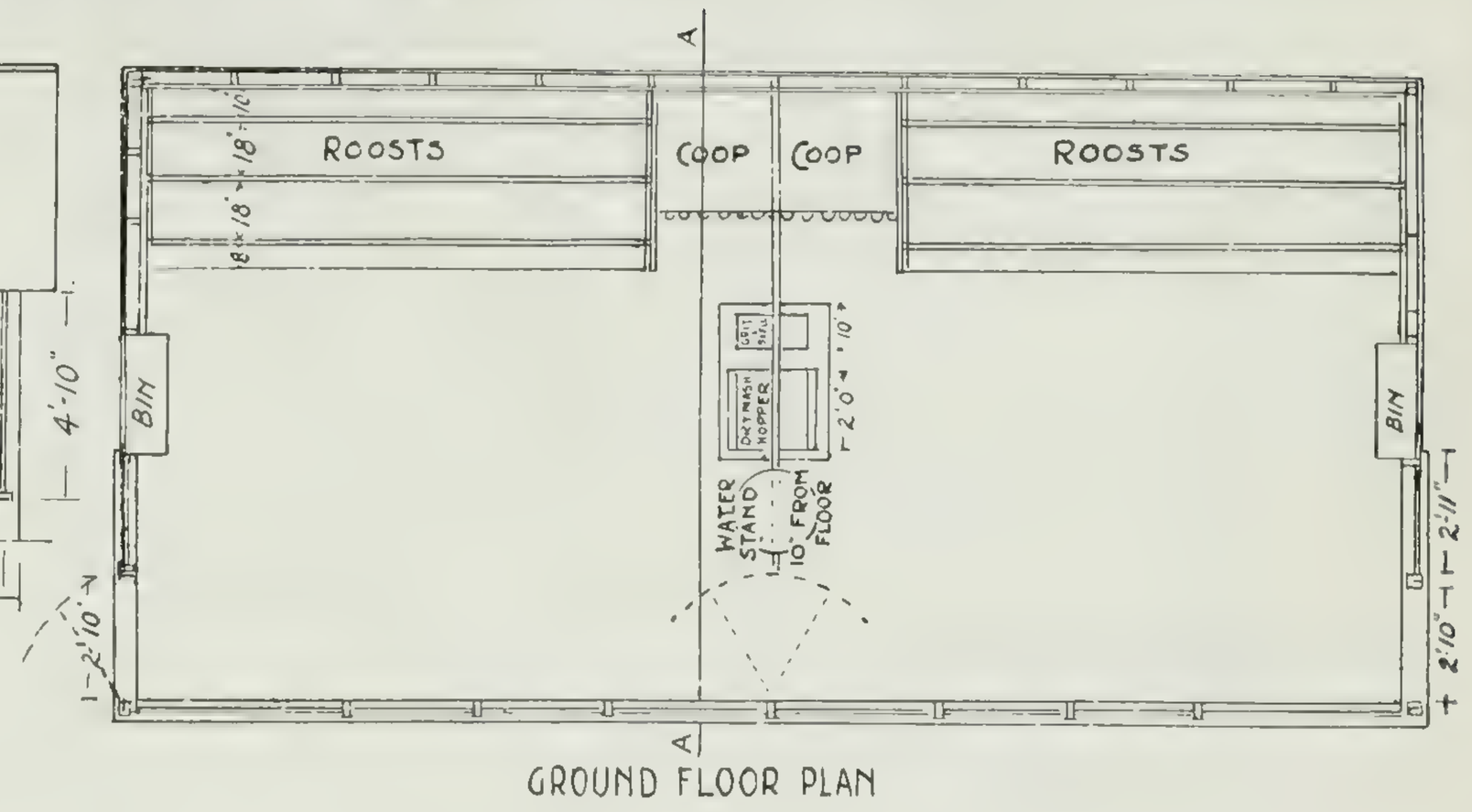
Frame of straw loft house.

The ventilator in the gable is removable so that the straw can be put in through this opening. A small hinged door would be just as serviceable. It could be shut during cold weather and opened when the weather was mild.

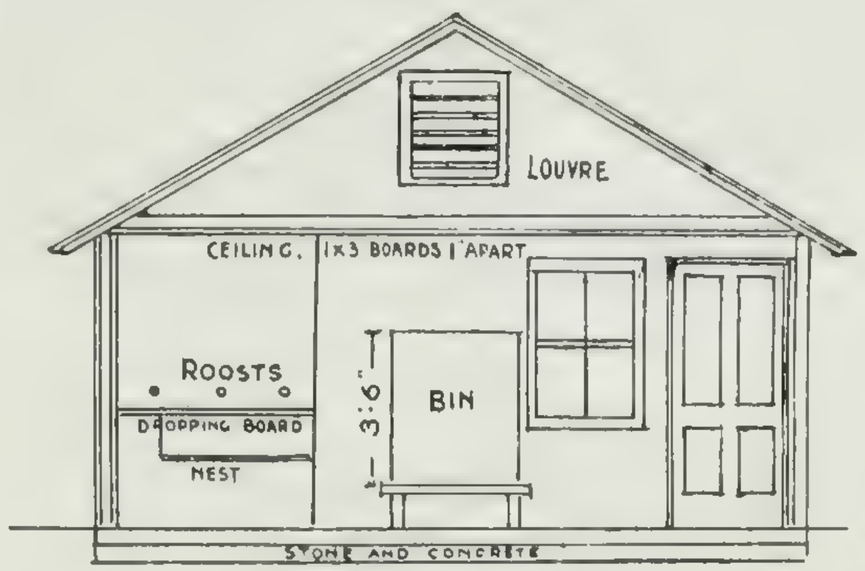
FARMERS POULTRY HOUSE -DOUBLE ROOF & STRAW LOFT



FRONT ELEVATION



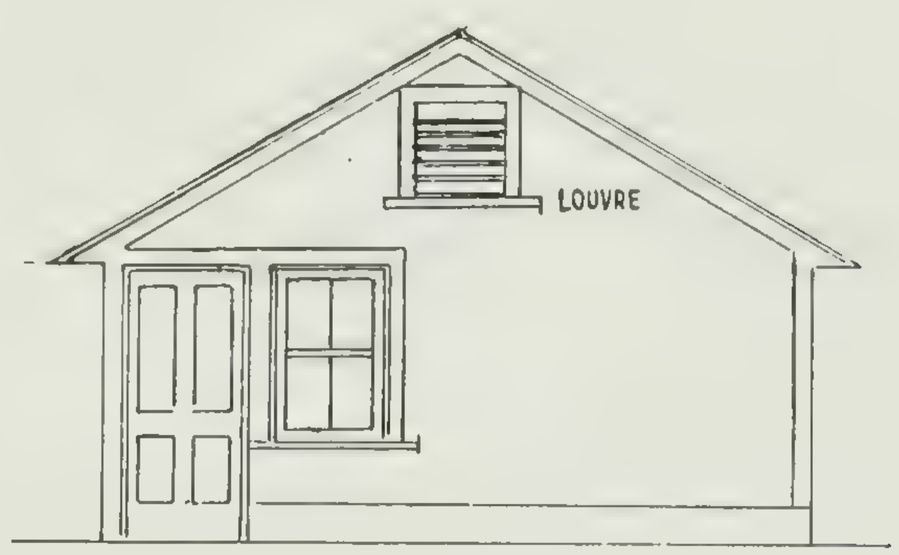
GROUND FLOOR PLAN



SECTION A,A,

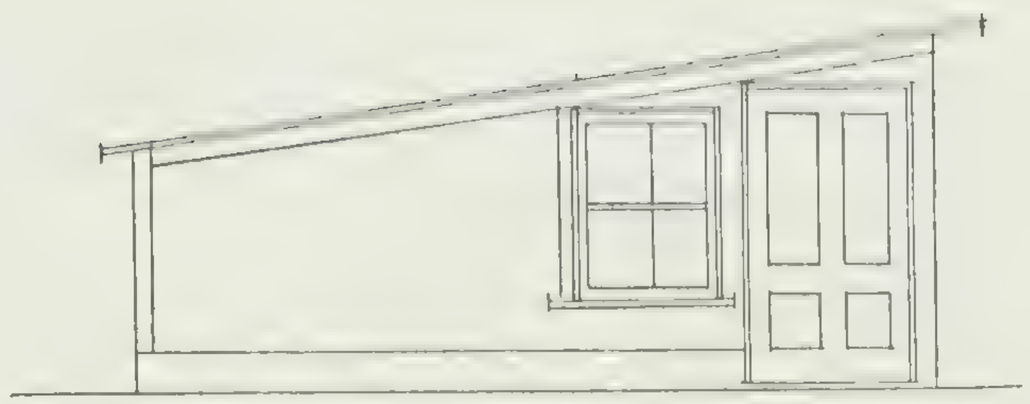


(WEST) END ELEVATION

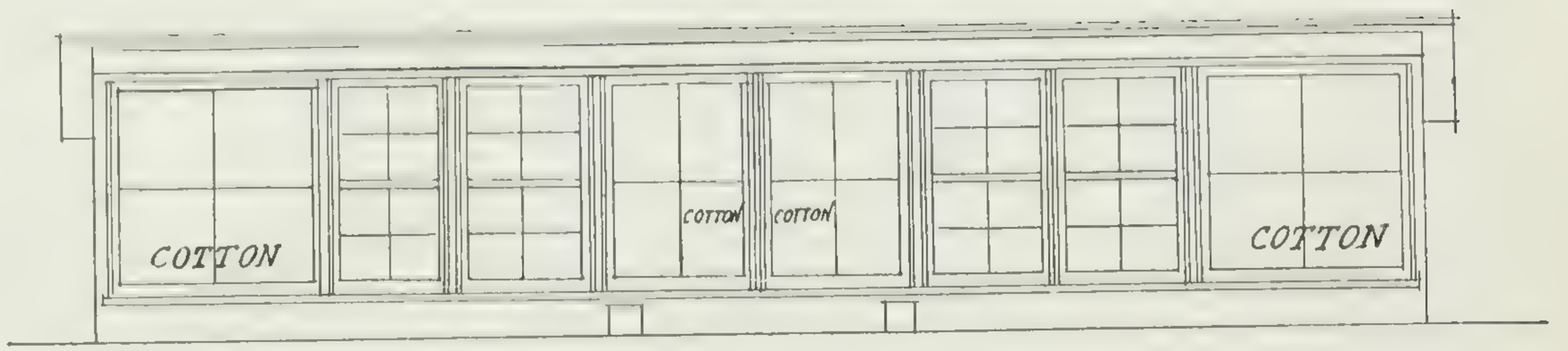


(EAST) END ELEVATION.

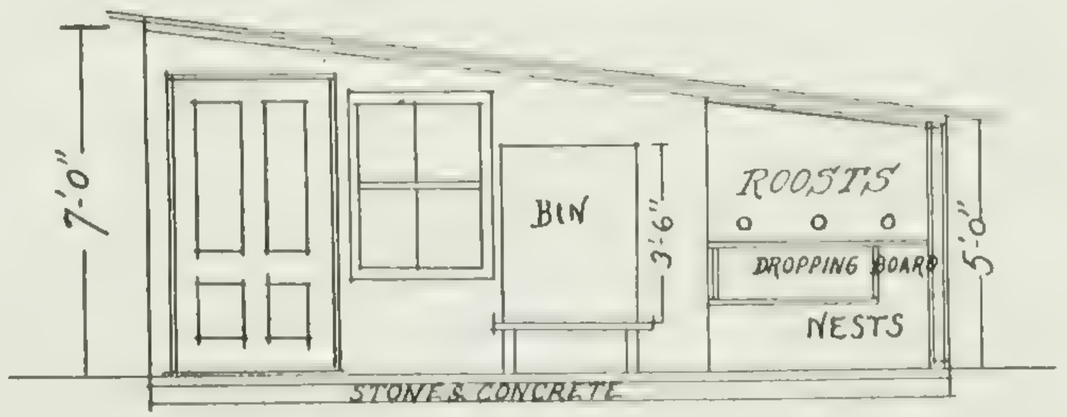
FARMERS POULTRY HOUSE · Shed Roof.



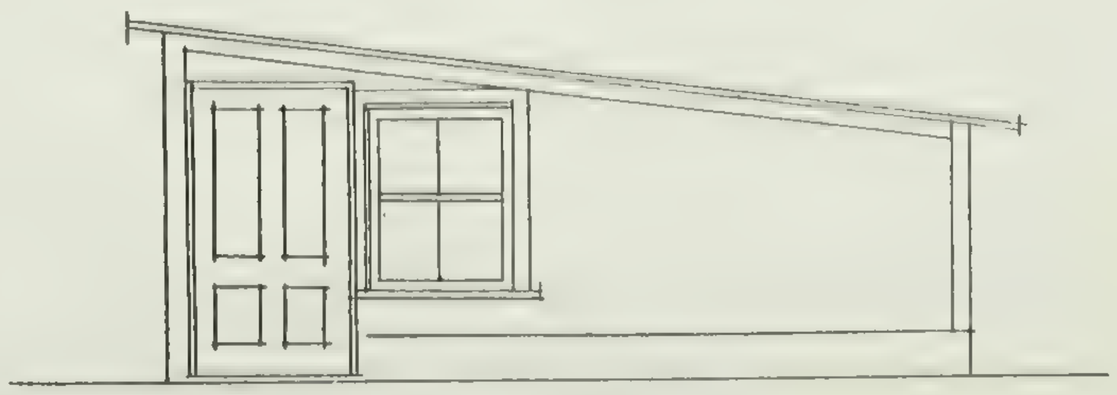
END ELEVATION



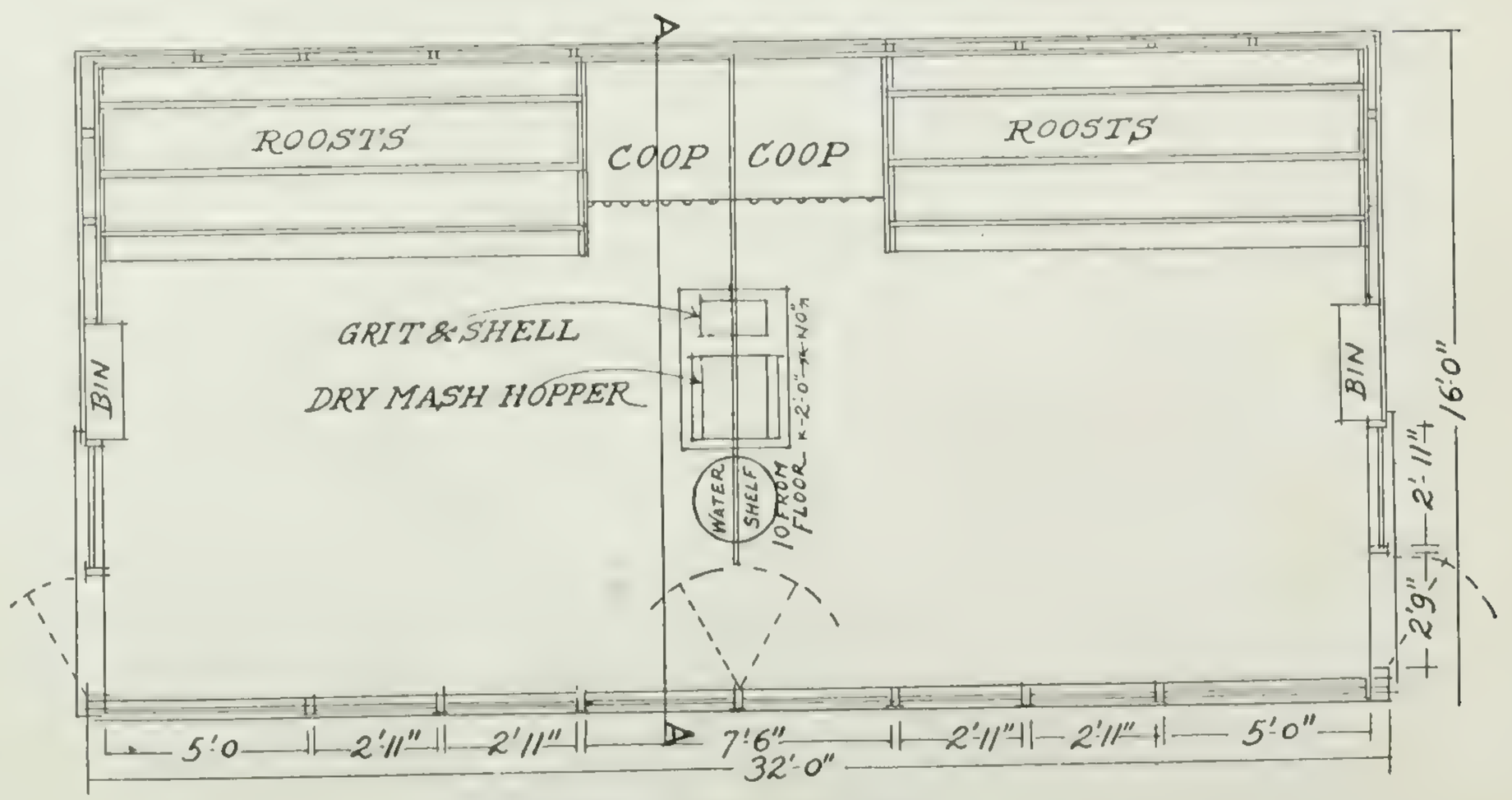
FRONT ELEVATION



SECTION A.A.



END ELEVATION



GROUND FLOOR PLAN



Turkey Yards. Yards similar to this were used for the rearing of the young turkeys.



Dressed. A pair of the turkeys reared in the yards weighing at 7 months dressed over 35 lbs.



Turkey shelters.
This shows the style of house and covered run-way first used for the young turkeys.

Though it cost 92 cents per head to feed the Barred Plymouth Rocks for 6 months and only 58½ cents for the White Leghorns, the margin of profit was better on the more expensive pen.

This was due to the better production of the heavier birds in the first months of the record, i.e., the Barred Plymouth Rocks in November averaged 8.6 eggs and the the White Leghorns only 1·4. The Plymouth Rocks were early hatched, had all reached maturity and 55 per cent were laying steadily when going into winter quarters in November, but of the White Leghorns only 12 per cent were laying at this time.

SURVEY WORK.

In May, 1915, a poultry survey was started with two groups of farmers, one in the province of Quebec and one in Ontario.

The object of this work was to obtain more data of the actual poultry conditions that prevail on the average farm and to endeavour to get the farm poultry plant put upon a business basis, with some one member of the family responsible.

The two groups selected were one in the vicinity of Cap Rouge, Que., and one near Merrickville, Ont. These were decided upon because they were convenient, one to the Central Farm and the other to the Experimental Station at Cap Rouge. It was hoped to be able to visit them once every month, but as the work was undertaken by two members of the staff here, Mr. Fortier and Mr. Robertson, it was not possible for them to make their visits regularly every month, but the farms were each seen as near once a month as possible.

The farmers in the Quebec group were more interested in poultry than those in the Ontario group, as the report and records given here indicate. Considerable of the poultry produce from the Quebec section was sold on the Quebec city market and brought a higher price than could be expected by the average farmer. Even here, where conditions might be considered as above the average, there was a good deal of wasted energy. However, it was encouraging to note the willingness of most of the farmers to profit by suggestions given. In some instances, new houses, new stock and new management were instituted upon the advice of the visitor and in most cases better methods were adopted.

The information desired is obtained in detail upon the three forms given below. Form 1, filled in by the visitor upon his first visit and retained for future reference; form 2 is for the use of the farmer to jot down his daily records, and form 3 is filled out once a month, from form 2, and sent by the farmers to this office or collected by the visitor upon his monthly visit.

DEPARTMENT OF AGRICULTURE—EXPERIMENTAL FARMS SYSTEM. Form No. 1.

YEARLY REPORT OF POULTRY SURVEY.

Year.....Branch Farm.....Name.....No.....

Eggs, Stock, and Food.		Eggs.		Poultry.		Average Price.	Value.	Total Revenue.		Remarks.
		Dr.	Cr.	Dr.	Cr.			$	cts.	
Balance last report	Dr.									
Laid	Dr.									
Received	Dr.									
Raised	Dr.									
Consumed	Cr.									
Marketed	Cr.									
For incubation	Cr.									
For breeding	Cr.									
Broken, etc	Cr.									
Died	Cr.									
Feed	Cr.									
On hand	Cr.									
Total										

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Form No. 1—*Continued.*

General Information.

1. Is there a house exclusively for poultry?
2. If not, where is the poultry housed?
3. What is the floor space?
4. Type of poultry house?
5. Square feet of glass?
6. Square feet of cotton?
7. Is the house satisfactory?
8. Poultry—yarded or free run?
9. Sanitary condition—surroundings?
10. Sanitary condition of house?
11. Who looks after the poultry?
12. What are the rearing appliances?
13. What selection is used?
14. Are trap-nests used?
15. What breed or breeds are kept?
16. What attention has been paid to breeding for egg production?
17. Are hatching eggs taken from a special breeding pen or the whole flock mated?
18. At what time are chicks hatched out?
19. Are the male birds allowed with the hens after breeding season?
20. Are the eggs gathered regularly?
21. How are they kept until sold?
22. How are the eggs marketed?
23. Where sold?
24. Miles distant?
25. Any attempt to produce guaranteed eggs?
26. Is the surplus poultry sold alive or dressed?
27. Is it specially fattened?
28. Kind of packages used for shipping?

Remarks.

16—90½ OTTAWA.

DEPARTMENT OF AGRICULTURE—EXPERIMENTAL FARMS SYSTEM.

FORM No. 2.

EGGS, STOCK AND FOOD DAILY RECORDS FOR POULTRY SURVEY.

Month..... Branch..... Name ..... No.....

Date.	Eggs.					Stock.							Food.						Remarks.
	Laid.	Received.	Consumed or broken.	Sold.	Used for Incubation.	Hatched.	Chicks died 1st Month	Received	Consumed.	Marketed.	Sold for Breeding.	Died.	Grain.	Meal.	Animal.	Green.	Grit or Shell.	Sundry.	
1																			
2																			
3																			
4																			
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26																			
27																			
28																			
29																			
30																			
31																			
Total																			

Balance on hand at the end of the month: Eggs— Stock— Breeds—

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Form No. 3.

DEPARTMENT OF AGRICULTURE—EXPERIMENTAL FARMS SYSTEM.

MONTHLY REPORT FOR POULTRY SURVEY—STOCK, EGGS, FOOD AND INCUBATION RECORDS.

Month ..... Branch ..... Name ..... No. .....

Stock.	Males.	Females.	Chickens.	A.O.V.	Lb.	Total. Dr.	Total. Cr.	Price.	Value.	Remarks.
Balance last report..	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Raised.....Dr.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Received.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Consumed.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Marketed.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sold for breeding...	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Cr. Died (diseases).....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
On hand.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total.....						.....	.....	.....	.....	.....

Eggs.	Hens.	A.O.V.	Doz.	Total. Dr.	Total. Cr.	Price.	Value.	Remarks.
Balance last report...	.....	.....	.....	.....	.....	.....	.....	.....
Laid.....Dr.	.....	.....	.....	.....	.....	.....	.....	.....
Received.....	.....	.....	.....	.....	.....	.....	.....	.....
Consumed	.....	.....	.....	.....	.....	.....	.....	.....
Marketed.....	.....	.....	.....	.....	.....	.....	.....	.....
For incubation.....	.....	.....	.....	.....	.....	.....	.....	.....
Cr. For breeding.....	.....	.....	.....	.....	.....	.....	.....	.....
Broken, etc.....	.....	.....	.....	.....	.....	.....	.....	.....
On hand.....	.....	.....	.....	.....	.....	.....	.....	.....
Total.....				.....	.....	.....	.....	.....

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Form No. 3—*Concluded.*

Food.	Kind.	Lb.	Price.	Value.	Remarks.
Grain					
Meal					
Milk					
Animal food					
Grit and shell					
Roots					
Green feed					
Total					

Incubation.	Eggs.	Hatched.	Chickens died 1st Month	Balance on Hand.	Remarks.
No. of hen eggs set (Nat.)					
" " " (Artif.)					
" A.O.V. "					
Total					

CAP ROUGE, QUE.

Thirty-five farmers in a radius of eight to ten miles of the Cap Rouge Experimental Station, were visited in May, 1915, and were selected as the Quebec group.

The farmers in the district selected for this survey work were fairly well advanced in poultry keeping. Nearly 50 per cent of them had fair to good poultry houses, and the others appeared anxious to improve.

The type of fowl kept in this section is more or less of a mongrel, a product of various crosses and not very satisfactory. About thirty per cent of the farmers keep what they believe to be pure-bred fowls, but not five per cent of them have flocks bred well enough to be recommended for breeding. Even where some pure-bred fowls are kept, there frequently are mongrels on the same farm and care is not always taken to maintain the pure breeds.

Upon the first visit, when the motive of the work was explained, two farmers refused to supply the information and were not included in the group. Thirty-five farmers promised to give the information required upon the forms. There was a total of 2,154 birds kept by the thirty-five farms, an average of 61 each. The number ranged from 25 on some farms to 225 on one farm.

During the first few months there was some difficulty in securing the required information, as very few of the farmers kept a record of their poultry. However, they were willing to do their part, and in a few months they were all giving a fairly complete statement of receipts and expenditures.

The monthly reports show, among other things, that some farmers secure excellent results in selling eggs throughout the year or from the sale of chickens, but these results vary greatly, according to the flock, and more especially the management.

Side by side were two farmers who shall be designated as Nos. 1 and 2. They had practically the same kind of poultry; they seemed to be giving the same amount of care and feed to their birds. One of them barely succeeded in making both ends meet, while the other one was getting a fair revenue.

DEPARTMENT OF AGRICULTURE—Experimental Farms System

YEARLY REPORT OF POULTRY SURVEY

(From May 1, 1915, to April 31, 1916).

Year 1916-17. Branch Farm, Cap Rouge. Name,..... No. 1.

Eggs, Stock, and Food.		Eggs.		Poultry.		Average Price.	Value.	Total Revenue.	Remarks.
		Dr.	Cr.	Dr.	Cr.				
							$ cts.	$ cts.	
Bal. last report...	Dr.	.....	.....	31	.....	.....	.....	.....	
Laid.....	Dr.	2,414	.....	.....	.....	.....	.....	.....	
Received.....	Dr.	.....	.....	1	.....	.....	.....	.....	
Raised.....	Dr.	.....	.....	24	.....	.....	.....	.....	
Consumed.....	Cr.	.....	1,739	.....	3	24 to 55c. dozen.	.....	39 23	
Marketed.....	Cr.	.....	465	.....	21	16 to 19 c. lb.	.....	30 40	
For incubation...	Cr.	.....	165	.....	.....	.....	.....	.....	.....
For Breeding....	Cr.	.....	.....	.....	.....	.....	.....	.....	
Broken, etc	Cr.	.....	45	.....	.....	.....	.....	90	
Died.....	Cr.	.....	.....	.....	4	.....	.....	.....	Old birds.
Feed	Cr.	.....	.....	.....	.....	.....	54 71	.....	Corn, oats, bran, roots,etc.
On hand.....	Cr.	.....	.....	.....	28	.....	.....	.....	
Total.....		2,414	2,414	56	56	.....	54 71	70 53	

Average birds kept 30; profit, $15·86; average per bird, ·52 cents.

DEPARTMENT OF AGRICULTURE—Experimental Farms System.

YEARLY REPORT OF POULTRY SURVEY

(From May 1, 1915, to April 31, 1916).

Year 1915–16. Branch Farm, Cap Rouge. Name. .....No. 2.

Eggs, Stock, and Food.	Eggs.		Poultry.		Average Price.	Value	Total Revenue.	Remarks.
	Dr	Cr.	Dr.	Cr.				
						$ cts.	$ cts.	
Bal. last report..			86					
Laid ..... Dr.	5,478							
Received.....	48					2 00		
Raised.....			110					
Consumed.....		5[illegible]		5			16 93	
Marketed.....		4,504		84			179 47	Eggs, 24c. to 60c. doz. Poultry, 16c to 22c. lb.
For incubation... Cr.		225						
For breeding....								
Broken, etc.....		40					0 80	
Died or lost.....		49		25				Incub. chicks.
Feed.....						104 94		Corn, oats, ground grain, bran, roots, clover, grit, shell milk, rice, bread, etc.
On hand.....		122		82			2 44	
Total.....	5,526	5,526	196	196		106 94	199 64	

Average birds kept, 74; profit, $82.70; average per bird, $1.11.

As a rule, the most satisfactory results are obtained where the wife or a girl or boy is managing the poultry. Where everybody looks after the poultry, nobody is responsible, and the results are never so good. Where the farmers accepted the advice and put one member of the family in charge, improvement at once was noted, the plant was cleaner, better accounts were kept, and more profit was the result.

At the beginning of this survey work, from 65 to 75 per cent of the farmers sold their products in the locality, through the corner grocer or the peddler; 25 per cent sold them to customers. Eighty-five per cent sold their products when the markets were congested and hardly 15 per cent distributed the sale throughout the year. At the beginning of the work, from 10 to 15 per cent kept a record of the amount expended on their flock; after one year's work 80 per cent send this office a monthly report as given in form 2, and accounts of receipts and expenditures are very carefully kept.

In order to encourage the members of the group to produce good stock and to establish a centre that might supply pure-bred fowls, a number of good Plymouth Rock cockerels were distributed last fall through the Cap Rouge Experimental Station to farmers who already had some good Barred Rock hens. In the spring of 1916, the other farmers, who had only grade hens, each received for hatching purposes thirty eggs of Barred Plymouth Rocks, these also coming from the best pens of the Cap Rouge Experimental Farm.

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FINANCIAL STATEMENTS.

In order to show the approximate revenue obtained from the poultry plants on some of the farms of the group, three financial statements are given below; the first two show a good profit from the flock and from each hen. An illustration of the poultry houses of one of these accompanies this report. The third report shows a profit of 3½ cents per bird. The illustration of the "barn" poultry house shows where this flock is kept, and to a large extent explains the lack of revenue.

DEPARTMENT OF AGRICULTURE—EXPERIMENTAL FARMS SYSTEM.

YEARLY REPORT OF POULTRY SURVEY.

(From May 1, 1915, to April 31, 1916.)

Year 1915--16. Branch Farm, Cap Rouge. Name, Jos. A. Coté. No. 34.

Eggs, Stock, and Food.		Eggs.		Poultry.		Average Price.	Value.	Total Revenue.	Remarks.
		Dr.	Cr.	Dr.	Cr.				
							$ cts.	$. cts.	
Bal. last report.		.....	.....	355	.....	.....	.....	.....	
Laid.....	Dr.	22,468	.....	.....	.....	.....	.....	.....	
Received.....		.....	.....	63	.....	.....	32 25	.....	
Raised.....		.....	.....	177	.....	.....	.....	.....	
Consumed.....		.....	2,364	.....	9	.....	.....	30 44	$6.80 poultry.
Marketed.....		.....	18,998	.....	233	.....	.....	670 88	$186.60 poultry.
For incubation..		.....	500	.....	.....	.....	.....	.....	
For breeding....	Cr.	.....	390	.....	.....	.....	.....	21 00	
Broken, etc.....		.....	.....	.....	.....	.....	.....	.....	
Died or lost.....		.....	.....	.....	27	.....	.....	.....	
Feed.....		.....	.....	.....	.....	.....	355 5 3	.....	Cost of food per bird, $1.24
On hand.....		.....	216	.....	326	.....	.....	4 32	
Total.....		22,468	22,468	595	595	.....	387 78	726 64	

Average birds kept 340; profit $337.86; average per bird, $1.

DEPARTMENT OF AGRICULTURE—EXPERIMENTAL FARMS SYSTEM.

YEARLY REPORT OF POULTRY SURVEY.

(From May 1, 1915, to April 31, 1916.)

Year 1915–16. Branch Farm, Cap Rouge. Name, Candide Dancause. No. 27.

Eggs, Stock, and Food.		Eggs.		Poultry.		Average Price.	Value.	Total Revenue.	Remarks.
		Dr.	Cr.	Dr.	Cr.				
							$ cts.	$ cts.	
Bal. last report.	Dr.	....	....	144	....	.....	.....	.....	
Laid.....	Dr.	10,500	...	...	.....	.....	.....	.....	
Received.....	Dr.	....	....	....	.....	.....	.....	.....	
Raised.....	Dr.	.....	.....	124	.....	.....	.....	.....	
Consumed.....	Cr.	.....	994	.....	41	Eggs, .. 24c. to 60c	.....	51 72	Eggs, $27.72; poultry $24..
Marketed.....	Cr.	.....	8,891	....	123	18c. to 25c lb.	.....	327 41	Eggs, $249.82; poultry, $77.59.
For incubation...	Cr.	.....	490	....	.....	.....	.....	.....	
For breeding....	Cr.	.....	.....	....	.....	.....	.....	.....	
Broken, etc.....	Cr.	.....	.....	....	....	.....	.....	.....	
Died.....		.....	.....	.....	.....	.....	.....	.....	
Feed.....		.....	....	.....	.....	.....	117 50	.....	Cost of feeding per bird 84c
On hand.....		.....	125	.....	104	.....	....	2 50	
Total.....		10,500	10,500	268	268	.....	117 50	381 63	

Average birds kept, 140; average number of layers, 97; profit, $264.13; profit per bird, $2.72.

OTTAWA.

SESSIONAL PAPER No. 16

DEPARTMENT OF AGRICULTURE—EXPERIMENTAL FARMS SYSTEM.

YEARLY REPORT OF POULTRY SURVEY.

(From May 1, 1915, to April 31, 1916.)

Year 1915–16. Branch Farm, Cap Rouge. Name,..... No. 23.

Eggs, Stock, and Food.		Eggs.		Poultry.		Average Price.	Value.	Total Revenue.	Remarks.
		Dr.	Cr.	Dr.	Cr.				
							$ cts.	$ cts.	
Bal. last report.	Dr.	.....	.....	14	.....	.....	.....	.....	
Laid.....	Dr.	966	....	..	.	.....	... .	.....	
Received.....	Dr.	.....	...	. .	..	.....	.....	.....	
Raised.....	Dr.	.....	....	26	. .	.....	.....	.....	
Consumed.....	Cr.	.....	332	.....	3	eggs.... 22c. to 42c doz.	.....	8 37	$1.50 from birds.
Marketed.....	Cr.	.....	609	.....	3	birds 50c. each.	.....	13 88	$1.50 from birds.
For incubation...	Cr.	.....	....	.....	.....	.....	.....	.....	
For breeding....	Cr.	.....	....	.....	.....	.....	.....	.....	
Broken, etc.....	Cr.	.....	16	.....	.....	.....	.....	. ....	
Died.....	Cr.	.....	.....	.....	12	.....	.....	.....	
Feed.....		.....	.....	.....	.....	.....	21 60	.....	No eggs laid in winter months.
On hand.....		.....	9	.....	22	.....	.....	8 18	
Total.....		966	966	40	40	.....	21 60	30 43	

Average birds kept, 20; profit, $8.83; profit per bird, 44 cents.

MERRICKVILLE, ONT.

When the Merrickville district was selected in which to start poultry survey work it was selected, not because it was especially adapted to poultry raising, or that poultry raising received special attention at the hands of the farmers of the district, but rather because it represented ordinary country conditions. A locality was not desired that represented poultry raising at its best, but rather one that would show whether poultry keeping as practised on the ordinary farm is a paying department; if so, to what extent, and if not, to find out why it is not and how conditions may be altered to form it into a paying branch of farm work.

After a year's investigation it may be said that in many respects the district was well chosen. Much valuable information has been obtained, and although a great deal of this is of a negative character, possibly as much good will come from studying this as from studying the successes.

OTTAWA.

The fact that the farms of this district are fairly widely separated and that the farmers were rather unresponsive, necessitated the covering of a great deal of ground for the work accomplished. However, in the limited survey possible, the marked successes of some are in striking contrast to the equally marked failures of others.

At the start there were fifteen farmers who expressed a willingness to co-operate in the work. The largest number of hens kept by any one farmer was 113 and the smallest was 24, with an average of about 65.

The Barred Plymouth Rock is the breed of fowl that is most popular throughout this district. There were two exceptionally nice flocks of Rhode Island Reds, one flock of White Wyandottes and the balance were Leghorns or Leghorn crosses.

Most of the poultry and eggs were marketed locally, that is, either at the village stores or to peddlers, but within the past year more of the farmers have been going farther afield, some shipping to Ottawa, Montreal, and Toronto, and the difference in prices has been so great in some cases that, no doubt, this plan will come into more general use.

It was difficult to get the farmers to keep accurate accounts, and in comparatively few cases was this done. Many were able to give complete reports of what the flock produced, but did not give an account of the feed used.

It was strikingly apparent that the farmers who kept closest account of their poultry were the ones who were making the most out of their flocks.

In no instance was there a farmer who made complete returns whose accounts did not show a satisfactory profit but in some cases, had the reports been complete, they would have undoubtedly shown that the poultry had been kept at a loss instead of a profit.

There were many reasons for the lack of success in most cases but the two reasons that were most apparent were:—

First, the failure to appreciate the necessity of the early hatching of chicks. It is the bird that lays in the winter that gives the greatest profit. The bird to lay in the winter must be properly matured before the cold weather sets in, and to be properly matured by that time pullets of the general purpose type such as Plymouth Rocks, Wyandottes, or Rhode Island Reds should be hatched by the first of May. Most farmers think June about the proper time to hatch.

Second, the "red mite." There were very few hen houses that did not have mites. In some cases the owners recognized the danger and kept the mites in check. In others the mites were allowed free fling, with the result that in some cases the fowls refused to use the houses and roosted out of doors, and in others egg production practically ceased at a time of the year when the yield should have been good.

The result of the work in this district showed conclusively that when properly handled the poultry on the farm was a very paying branch of farm work. It also showed that the neglect of certain essentials, chief of which is cleanliness, would result in direct loss.

The following statement is given to show what one farmer accomplished. This farmer cleared practically $2.70 per hen, and when it is considered that the prices which he received for his eggs were those of the country store it will be realized that had he been so situated as to be able to command the better city prices, the returns would have been much higher.

It is not every farmer that can make such a showing; but given the same care and attention to details there is no reason why every flock should not give satisfactory results.

OTTAWA.

SESSIONAL PAPER No. 16

YEARLY REPORT OF POULTRY SURVEY.

Year 1915. Branch farm, Merrickville; name, M. Carson.

Eggs, Stock, and Food.	Eggs.		Poultry.		Price.	Value.	Total Revenue.	Remarks. — Feed consumed.
	Dr.	Cr.	Dr.	Cr.				
					$ cts.	$ cts.	$ cts.	
Bal. last report.	.....	.....	24	.....	.....	.....	.....	
Laid.....	3,209	.....	.....	.....	.....	.....	.....	1,932 lb. barley and oats at $1.75.....$33 81
Dr. Received.....	.....	.....	.....	.....	.....	.....	.....	60 lb. wheat at $1.00 1 00
Raised.....	.....	.....	50	.....	.....	.....	.....	174 lb. corn and buckwheat at $2.00.... 3 48
Consumed.....	.....	1,187	.....	.....	Eggs 19c. to 36c	doz.....	30 00	338 lb. bran and middlings at $1.20.... 4 05
Marketed.....	.....	1,872	.....	23	Poultry 18c. lb.	.....	35 85 22 40	200 lb. oyster shell and grit..... 1 80
For incubation..	.....	150	.....	.....	.....	.....	.....	122 lb. oat chop at $2.00..... 2 44
Cr. For breeding....								Purina chick feed... 2 00
								$48 58
Broken, etc.....	.....	.....	.....	.....	.....	.....	.....	
Died.....	.....	.....	.....	.....	.....	.....	.....	
Feed.....	.....	.....	.....	.....	.....	48 58	.....	There was a little milk fed in winter, which has not been taken into account.
On hand.....	.....	.....	...	24 hens.....		.....		
				27 pullets.....			25 00	
Total.....	3,209	3,209	74	74	.....	48 58	113 25	

Profit, $64.67; average profit per bird, $2.70.

EXTENSION WORK.

(*Conducted and reported on by Mr. Fortier.*)

During the year, sixty-two lectures were given in the province of Quebec. The attendance at these lectures was highly satisfactory; the maximum was 400, the minimum 40, and the average 145. The total attendance was 9,019.

A pleasant feature of this year's meetings was the presence of a large number of ladies who seemed to take a very keen interest in poultry and agricultural matters. This is a good sign, as every one knows that any movement in which women become interested is almost sure to succeed.

Several poultry plants, chiefly in the province of Quebec, were visited at the formal request of their owners. Advantage was taken of this opportunity to discuss with the interested parties the construction of poultry houses, feeding, breeding, selection, etc.

A VISIT TO CHICOUTIMI.

The campaign undertaken under the auspices of the Dominion Department of Agriculture in the district of Chicoutimi, was resumed this year. Together with Mr. Wilfrid Simard, farmer, of St. Gédéon, Lake St. John, Quebec, 41 parishes were visited

from the 15th of June to the 31st of July, 1915. Many requests for male birds or eggs from pure-bred fowls were received from these farmers who were also anxious to organize poultry breeding societies.

The poultry part, in which for the last few years the farmers of these districts have taken a special interest, was treated by myself in a manner as practical as possible. According to the statistics of the last census, the county of Chicoutimi-Saguenay produces annually $143,024.50 worth of eggs and fowl. However, each year, the merchants of the leading centres are compelled in winter to import large quantities of eggs and poultry to satisfy the local demand.

Almost all the parishes of the country were visited for the third time. Everywhere the farmers were strongly urged to take a little more interest in the breeding of poultry in order to satisfy at least the local demand.

They were advised among other things to change their old methods of breeding and to improve the quality of their stock by observing the following recommendations:—

(1) To secure a good breed of fowls.
(2) To have pullets hatched earlier in the spring.
(3) To give more attention to the chicks during the growing period.
(4) To avoid putting too many young and adult fowls in poultry houses and parks.
(5) To adopt a more rational system of feeding.
(6) To provide a poultry house well lighted, perfectly dry and entirely distinct from the stables, the barns or other live stock buildings.

Although a great deal remains to be done, the poultry industry is fast improving; the breeding of fowl increases rapidly and is beginning to get well established among our rural population.

The establishment of a good poultry plant on the farm is such a profitable source of revenue that it is difficult to imagine how an intelligent farmer can neglect the same.

In the near future farmers could easily find in the large cities of the province a good market for all the eggs and fowl that they can produce. According to the wholesale dealers of Montreal, the province of Quebec hardly produces 10 per cent of the eggs and fowl that are sold in the market. The remainder, that is 90 per cent, comes from Ontario and other provinces, and the United States.

During this trip, the advantages of agricultural and co-operative associations were dealt with at each place and one was organized for the district of Chicoutimi.

This co-operation includes more than 850 farmers, men and women who are quite willing to undertake, under the direction of the Central Experimental Farm, any experimental work that may be entrusted to them.

SESSIONAL PAPER No. 16

THE NORTH SHORE OF THE ST. LAWRENCE.

Once again the farmers on the north shore of the St. Lawrence were visited (see 1915 report, page 1,120). For the first time we stopped at Bersimis, about 100 miles below Tadoussac Most of the people living there are Indians of the Montagnais tribe. This is not an agricultural centre; however, it was a pleasant surprise for us to see splendid crops of potatoes and other vegetables.

While conversing with the people of the place, we learned that about twenty families were established at La Pointe aux Outardes, about 20 milles from Bersimis, in a part of the Saguenay county, which, so far, had been supposed to be entirely deserted. We went there in a small gasoline launch and were agreeably surprised to see about 10 square miles of good land, quite suitable for general agriculture. At the meeting that was held at night, the old farmers stated that all grain ripens well; there is an abundance of hay, and potatoes, cabbage, corn, and tobacco are grown with success.

It was the first time that these good settlers had had the advantage of hearing agricultural lectures. They seemed to appreciate the information which was given to them and they asked us not to forget them in the future.

We stopped at about the same places that had been visited for the first time in 1914.

At Rivière au Tonnerre, we had the pleasure to observe progress in poultry keeping, and poultry houses are being built. So far, no attention had been paid to this matter. During the summer, the fowls run about as they like and during the winter they are kept in the cellars or in the attics of the buildings. There are only a few flocks of Barred Plymouth Rocks, on the north shore, at Rivière au Tonnerre and Natasquan. In the latter place, we noted a considerable improvement in the flocks of the parish priest and Mr. Joncas. The accompanying illustrations show "the old" and "the new" poultry houses in one yard here.

EXPERIMENTAL STATION, CHARLOTTETOWN, P.E.I.

REPORT OF THE SUPERINTENDENT, J. A. CLARK, B.S.A.

POULTRY.

A permanent poultry house for laying hens, 32 feet long by 16 feet deep, was built about the centre of the poultry yards in August, 1915. It faces south and has a combination of glass and cotton front, the row of glass windows being below and the cotton above them. The foundation consists of a cement slab. A 10-inch plank was set on edge to make the form. The centre was filled with broken stone and a 3-inch layer of coarse cement spread over the stone and down against the outside forms. One inch of strong cement was used to give a hard surface to the foundation. A peak roof was put on this building with a loft of straw.

In the autumn a poultry supply house, 30 by 20 feet, with incubator cellar, etc., was built in the northeast section of the poultry yards. This building contains, beside the incubator cellar, an egg room, a coal room and a bee storage room in the basement; a large work room with supply bins, a bedroom and an office on the ground floor. The attic was floored over and is used as a storage room. This building is supplied with water and electric light.

NEW YARDS.

The poultry yards were extended so that the poultry fence now encloses about four acres of land and includes most of rotation "F," which lay between the Station buildings and the railway track.

BREEDING STOCK.

Two breeding pens of one-year-old Barred Plymouth Rocks were mated up. One pen of one-year-old White Leghorn hens was mated with a Barron White Leghorn cockerel. The season was much more favourable for good hatches than 1914. The percentage of chicks dying in the shell was relatively small. The percentage of fertile eggs hatched by the incubators ran from 55 per cent to 62 per cent, while by natural incubation, using broody hens, the percentage of fertile eggs hatched ran from 72 per cent to 89 per cent.

A brief summary of all the eggs incubated showed that 165 were infertile, 15 developed blood rings, 90 were removed because of dead germs, 384 hatched out, there were 8 cripples, leaving 376 that were transferred to brooder or left with the hens out of a total of 770 set; or 48·8 per cent of the eggs developed strong chicks. 303 chickens were raised to maturity, or 80·6 per cent of the number hatched.

BROODING AND REARING CHICKS.

A hard-coal brooder gave more satisfactory results than one heated by kerosene and at a very much reduced cost for operation. Some difficulty was experienced in keeping the fire regular but it gave much better satisfaction and a larger percentage of strong chicks than the former kerosene brooder stove. The method of feeding was

similar to former years. The chickens were not fed until hungry and were given a little sand first, then bread crumbs, chick feed, rolled oats and finely cracked mixed grain. The chicks were not given more at a feed than they would clean up. Grass and sprouted oats were supplied as needed. Clean water and grit were always before them.

As soon as the weather was fit they were allowed to run outside, and were transferred to rearing houses when feathered out. Only natural heat was used in these rearing houses. Each house had a closed-in run so that no loss occurred from crows, hawks, or cats. The chicks hatched by hens were doubled up; two hatchings to a hen. The hen was given a small shelter box and a covered run. The chicks were healthy and grew rapidly. Nineteen eggs were obtained in October from pullets that were hatched out on April 22.

DAY-OLD CHICKS.

A trial shipment of 100 eggs was sent to Fredericton, N.B., incubated there, and the 38 strong chicks hatched from the lot were returned as day-old chicks. The incubator report read as follows: 25 infertile, 13 blood rings, 3 dead germs, and 38 strong chicks. These arrived in good shape, but they did not do well afterwards. At the end of two weeks 16 were living and 10 grew to maturity.

A lot of 100 eggs was received from Fredericton and set on May 7, along with 100 eggs from our own pens, in a Tamlin incubator. The hatching record was as follows:—

	Infertile.	Blood Rings.	Dead Germs.	Total Hatched.	Cripples.	Weak.	Shipped.
Fredericton.....	8	3	32	34	3	6	25
Charlottetown.....	15	1	8	66	0	0	66 put in brooder.

The 25-day old chickens that were shipped to Fredericton on May 29 reached their destination that night. Two were dead and two died before June 2. Out of the 66 hatched at the same time in the same incubator, 51 grew to maturity.

The above would indicate that the shipment of eggs for hatching reduces their hatchability very much and that the common carriers destroy a number of chicks in transit even when they go right through.

BROILERS.

A trial shipment of White Leghorn broilers was made to Halifax and 60 cents net per pair was realized. The average dressed weight of these broilers was 1⅘ pounds at three months of age.

WINTER Egg Records.

	Pen Breed.	No. of Birds, Nov. 1.	No. of Birds, Mar. 1.	Age.	Eggs Laid (by months during winter).					
					Nov.	Dec.	Jan.	Feb.	Mar.	Total.
1	B. P. Rocks.....	17	17	Pullets.....	.....	12	76	91	182	361
2	W. Leghorns.....	24	23	Pullets.....	.....	31	86	218	348	683
3	B. P. Rocks.....	20	19	Hens.....	152	149	84	89	223	697
4	B. P. Rocks.....	21	20	Hens.....	60	83	191	192	258	784
6	W. Leghorns.....	30	30	Hens.....	19	3	.....	26	310	358
7a	W. Leghorns.....	50	49	Pullets.....	101	263	266	306	598	1,534
7b	B. P. Rocks.....	50	49	Pullets.....	156	314	300	418	454	1,642
	Totals.....	212	207		488	855	1,003	1,340	2,373	6,059

The hens in the above houses had been trap-nested as pullets. Their records as pullets and the size and shape of their eggs were used in making selections in addition to breed type and breed characters. The pullets were trap-nested during the season and the records will be used in making future selections.

The dry mash that was supplied to each house in a hopper was as follows: Bran, 2 parts; middlings, 1 part; corn meal, 1 part. The whole-grain mixture that was fed in the litter was made up of equal parts of wheat, oats, barley, and buckwheat. Mangels and meat were fed as required. Grit and oyster shell were supplied continuously in hoppers. Charcoal was supplied occasionally. Water was always available to the hens, and milk was supplied whenever it was obtainable from the dairy. Bone meal and blood meal were fed as required.

TEMPERATURES OF HOUSES.

Maximum and minimum temperatures were taken morning and evening in the following houses. A brief description of the houses is here given:—

Colony House.	Built.	Size.	Description.
Number	Year.	Feet.	
3	1913	10 x 12	Shed roof, shingled, glass window in centre of front, with squares of cotton on each side, also glass below cotton.
1	1914	8 x 12	Shed roof, cotton above glass.
4	1913	10 x 12	Shed roof, glass window in centre of front; two large cotton squares on either side.
6	1912	8 x 12	Pitch roof, shingled, straw loft, sliding glass window, 20 x 20 inch square of cotton.
7	1915	10 x 32	Pitch roof, shingled, straw loft, cotton above glass along the entire front.

Variation in Temperatures in Houses.

Breed.	January.				February.				March.			
	Max.	Min.	Mean.	Mean Range.	Max.	Min.	Mean.	Mean Range.	Max.	Min.	Mean.	Mean Range.
	°	°	°	°	°	°	°	°	°	°	°	°
1 B. P. Rocks.	62	0	30·616	15·133	58	6	28·284	16·362	65	6	34·411	19·242
3 " .	54	4	28·441	17·917	56	11	27·594	22·327	64	2	33·779	24·179
4 " .	46	4	27·674	12·583	50	6	25·543	16·844	64	8	31·451	19·516
6 W. Legs.....	48	4	29·7	15·2	56	0	28·742	18·586	62	6	32·566	18·933
7 "	44	8	30·566	10·005	48	6	30·098	11·857	52	16	35·127	10·458
Outdoor temperatures.....	43	10	18·855	16·226	45	16	17·103	17·903	47	10	19·548	15·032

House No. 3, in which the greatest variation of temperatures occurred, was a little more exposed than the others to the west and northwest winds. The lumber had shrunk so that it was not so tight as the newer houses, yet the birds in this house seemed quite as healthy as any. No combs were frozen and the house was dry.

The new permanent house has been very satisfactory. The temperatures showed much less variation and the mean temperature for the three winter months was just at 32 degrees.

EXPERIMENTAL FARM, KENTVILLE, N.S.

REPORT OF THE SUPERINTENDENT, W. SAXBY BLAIR.

POULTRY.

THE BUILDINGS.

The equipment for housing poultry consists of one permanent house for 100 hens, 16 by 32 feet, divided into two pens, and seven colony houses, 8 by 12 feet, capable of holding 25 hens each.

STOCK.

Three breeds were carried during the past year, Barred Plymouth Rock, Rhode Island Red, and White Wyandotte.

The number on hand at the start of the season, March 31, 1915, was as follows:—

Barred Plymouth Rocks,	8	males,	17	hens,	92	pullets	.. ..	117	total.
White Wyandottes	4	"	13	"	36	"	.. ..	53	"
Rhode Islands Reds	2	"	4	"	20	"	.. ..	26	"

After the breeding season those not required for egg production were disposed of and those kept during the past winter for breeding stock numbered 42 Barred Plymouth Rocks, 28 White Wyandottes, and 17 Rhode Island Reds.

The stock carried during the winter of 1915-16 is given in the following table:—

Breed.	Males.	Hens.	Pullets.	Total.
B. P. Rocks	4	42	104	150
Rhode Island Reds	4	17	46	67
White Wyandottes	2	28	20	50

INCUBATORS.

The incubators are run in the basement of the incubator building. The walls and floor of this room are constructed of concrete. The average temperature and humidity of the room during the different hatches are given in the following table:—

	Room Temperature.	Room Humidity.
March 9th	49·47	74·61
April 2nd	56·95	74·80
April 29th	58·33	77·57
May 2nd	58·52	77·19

The incubators used are the Prairie State, Tamlin, and Cyphers. The former has a capacity of 400 eggs and the latter 200 eggs each. The first two were operated three times, the latter twice. The hatch obtained was as follows:—

TABLE showing Hatching Results from various Incubators.

	When set.	No. set.	No. Eggs infertile.	Dead Germs.	Total hatched.	Cripples.	Per cent left in hatched.
Prairie State	March 9	373	43	31	147	15	49.1
Tamlin	" 9	192	21	14	95	9	60·5
Prairie State	April 2	368	41	24	212	6	69·9
Tamlin	" 2	192	26	30	88	2	64·7
Cyphers	" 2	240	18	36	106	5	56·9
Prairie State	" 29	380	59	28	247	8	84·3
Tamlin	May 2	186	58	18	85	4	77·2
Cyphers	April 29	250	50	18	82	12	45.0

TABLE giving the summary of the above records of incubators for each month.

—	Hatches.	No. eggs.	Infertile.	Dead Germs.	Total hatched.	Cripples.	Per cent left in hatched.
Prairie State	3	1,121	143	83	606	29	67·7
Tamlin	3	570	105	62	268	15	66·5
Cyphers	2	490	68	54	188	17	51·1

KENTVILLE.

HATCHING RECORD OF THE DIFFERENT BREEDS.

A record has been kept of the eggs hatched from the different breeds and results are set forth in the following table:—

TABLE showing hatching records of various breeds.

—		No. of Eggs Set.	Infertile.	Dead Germs.	Hatched.	Per cent Total Hatched.	Per cent Fertile Hatched.
W. WYANDOTTES—							
Cyphers	April 29	60	9	8	22	36·6	43·1
Prairie State	" 2	21	5	2	10	47·6	62·5
Cyphers	" 2	60	5	19	15	25·0	27·2
Tamlin	" 2	96	12	20	32	33·3	38·0
Prairie State	March 9	46	13	2	7	15·2	21·2
Tamlin	" 9	48	8	2	24	50·0	60·0
Prairie State	April 2	100	20	8	51	51·0	63·7
Totals and averages		431	72	61	161	37·3	44·8
B. P. ROCKS—							
Prairie State	April 2	252	33	14	140	55·5	63·9
Cyphers	" 2	120	13	11	54	45·0	50·4
Tamlin	" 2	96	14	10	56	58·3	68·2
Prairie State	March 9	219	25	26	102	46·5	52·5
Tamlin	" 9	58	7	5	26	44·8	50·9
Cyphers	April 29	180	41	10	52	28·8	37·4
Prairie State	" 29	170	36	13	133	78·2	99·2
Totals and averages		1,095	169	89	563	51·4	61·4

Breed.	Machine.	Date.	No. of Eggs. Set.	Infertile.	Dead Germs.	Hatched.	Per cent Total Hatched.	Per cent Fertile Hatched.
R. I. Reds..	Prairie State....	April 2..	95	3	8	62	65·1	67·3
	Cyphers.....	" 2..	60	.....	6	37	61·6	61·6
	Prairie State...	March 9..	37	1	1	20	54·0	55·5
	Tamlin.....	" 9..	48	1	1	22	45·8	46·8
	Cyphers.....	April 29..	10	.....	.....	8	80·0	80·0
	Prairie State...	" 29..	90	3	7	63	70·0	72·4
Totals and averages....		.....	340	8	23	212	62·3	63·3

SUMMARY of Hatching Records from the different Breeds.

Breed.	Eggs Set.	Fertile.	Per cent Fertile.	Per cent Total Hatched.	Per cent Fertile Hatched.
R. I. Reds	340	332	97·7	62·3	63·8
B. P. Rocks	1,085	916	84·4	51·9	61·4
W. Wyandottes	431	359	83·3	37·4	44·8
Totals and averages	1,856	1,607	86·5	50·4	56·6

. KENTVILLE.

SUMMARY of Hatching Records from the different Machines.

Machine.	Eggs set.	Fertile.	Hatched.	Per cent Total Hatched.	Per cent Fertile Hatched.	Per cent Fertile.
Prairie State	1,030	891	588	57·0	65·9	86·5
Tamlin	396	304	160	40·4	52·6	76·7
Cyphers	490	322	178	36·3	55·2	65·7
Totals and averages	1,916	1,517	926	48·4	61·0	79·1

NATURAL INCUBATION.

Twenty-four hens were set on nests containing fourteen eggs each. These hens were shut on their nests and only allowed off at certain periods for food and exercise. During this period the nests were examined and all broken eggs and droppings removed, after which the hens were allowed to go back to the nests promiscuously. The eggs used in these nests were from the same stock as those used in the incubators.

TABLE showing Hatch obtained from the Different Breeds, by Natural Incubation.

Breed.	Eggs set.	Fertile.	Per cent Fertile.	Hatched.	Per cent Total Hatched.	Per cent Fertile Hatched.
R. I. Reds	99	87	87·9	71	71·7	81·6
B. P. Rocks	161	126	78·3	97	60·2	76·9
Wyandottes	75	66	88·0	36	48·0	54·5
Totals and averages	335	279	83·2	204	60·8	73·1

ARTIFICIAL versus Natural Hatching.

	Total Eggs Set.	Fertile.	Per cent Fertile.	Hatched.	Per cent Total Hatched.	Per cent Fertile Hatched.
Natural	335	279	83·2	204	60·8	73·1
Artificial	1,916	15,17	79·1	926	48·4	61·0

CHICKENS.

The three hatches of the incubators resulted in 1,053 chickens. The first hatch of 242 came off on March 31, the second hatch of 406 on April 23, and the last hatch of 414 on May 20. Together with these we had 204 chicks hatched under hens, making a total of 1,257 chickens hatched. The chickens were given a run adjacent to the other poultry yards which provided both sunshine and shade.

KENTVILLE.

RATION FOR YOUNG CHICKS.

The baby chicks were not fed for forty-eight hours after they had hatched, when they were given stale bread crumbs moistened with sweet milk for several days. This feed was given morning, noon and night; in addition rolled oats and Cyphers Scratch Feed were scattered in the litter between these feeds. After seven days the last-named feeds were supplemented by a hopper mixture made up of bran 10 parts, rolled oats 4 parts, corn meal 4 parts, and sifted meat scrap 2 parts by weight mixed together. After two weeks the chicks were given coarser feeds composed of equal parts cracked wheat, cracked corn and crushed oats. Chicken grit was also given. Water was before the chicks all the time. Some green feed such as sprouted oats and lettuce leaves were given occasionally to the young chicks.

The chickens were given a run and put out in colony houses as soon as the weather was fit and were given the usual coarse feeds, about one-half of which was cracked corn, and the balance principally oats, with some wheat. The hopper mixture given above was before the chicks all the time to feed on as they wished. The coarse feeds were fed in the morning and afternoon by scattering on the ground.

WINTER RATION FOR LAYING HENS.

The following whole grain mixture was fed to the hens from November 1 to March 31:—

100 pounds corn; 100 pounds oats; 50 pounds wheat.

This whole grain ration was scattered in a deep litter on the floor at the rate of 3 quarts per day for twenty-five birds. One-third of this ration was fed in the morning and the remainder at 3.30 in the afternoon. The litter was examined frequently for excessive feeding and if grain was found the ration was diminished.

In addition to the above ration a dry mash made up as follows was constantly before the hens: 4 parts bran, 2 parts cornmeal, 2 parts ground oats, and 1 part meat meal; 1 quart salt was added to every 500 pounds of this mash. Each pen was also supplied with charcoal, grit and shell.

Green food was supplied in the form of beets, mangels and chopped clover hay. Both milk and water were supplied as drink.

One pen of each of the three breeds was made up of hens and one each of pullets, the latter being well matured, and two pens one each of Rhode Island Reds and Barred Rocks were made up of late maturing pullets to compare with early matured stock of the same breeding. These were fed alike throughout the period.

The results show that the early hatched pullets are more profitable than either late pullets or yearling hens.

GROUND LIMESTONE FOR POULTRY GRIT AND SHELL.

Ground limestone has been advised as suitable for poultry in that it will supply the necessary grit, and the lime required for shell. Tests have been made here during the past winter and we have found that it is equally as good as the granite grit and oyster shell.

KENTVILLE.

EXPERIMENTAL FARM, NAPPAN, N.S.

REPORT OF THE SUPERINTENDENT, W. W. BAIRD, B.S.A.

POULTRY.

The Farm at Nappan has lost the services of Evan D. Craig, who gave up his work in April and joined the 193rd Nova Scotia Highlanders for active service overseas. He has been in charge of the poultry work since January, 1914, and needless to say he will be greatly missed in carrying on the work at this Farm, where he has always given most satisfactory service in not only managing the poultry work, but the apiary as well.

THE SEASON.

In poultry raising, as in all other things, a good start means a great deal. Consequently, in starting to rear the chicks in the spring it is only possible to reach the highest production when conditions governing such are most favourable. It may therefore be stated that the weather conditions during the spring of 1915 were very detrimental to successful chick rearing, in that it was continuously dull, cold, and wet until well into June. Not only was it detrimental to the health of the chicks, but it was found that the laying hens did not do so well during such a cold, wet period. It was disagreeable for them outside; therefore, they would not go out into the yard to get grass and many of the little things which go to stimulate egg production. Further, the crows gave considerable trouble in picking off the young chicks. However, these were fairly well dealt with by the use of a shot gun.

STOCK.

Three breeds were kept at the Farm, namely, Barred Rocks, White Wyandottes, and White Leghorns.

The following is a list of the breeds wintering in the different pens:—

	Males.	Hens.	Pullets.	Total.
Barred Rocks	5	48	50	103
White Wyandottes	4	46	11	61
White Leghorns	2	27	15	44
Aggregate	11	121	76	208

INVESTIGATIONAL WORK.

A continuation was made of the work commenced in 1913-14 in collecting data on the fertility and hatchability of eggs and viability of chicks from the three breeds fed on different rations, housed in different types of houses, hatched by artificial versus natural incubation.

TEMPERATURES OF VARIOUS HOUSES.

The following table shows the maximum and minimum temperatures of the different houses, also proportion of glass and cotton in each:—

TEMPERATURE OF HOUSES.

No. of Pen.	Floor space.	Cubic air space.	Cubic space per bird	Glass.	Cotton.	TEMPERATURES.																			
						Maximum.					Minimum.					Range.					Average.				
						Nov.	Dec.	Jan.	Feb.	Mar.	Nov	Dec.	Jan.	Feb.	Mar.	Nov	Dec.	Jan.	Feb.	Mar.	Nov.	Dec.	Jan.	Feb.	Mar.
	sq. ft.	cu. ft.	cu. ft.	sq. ft.	sq. ft.	°	°	°	°	°	°	°	°	°	°	°	°	°		°	°	°	°	°	°
1.....	256	1,764	33·3	25·8	52·8	60	49	48	51	64	24	11	1	10	3	36	38	49	61	61	40·3	34·9	27·8	26·3	33.
2.....	256	1,764	33·3	25·8	52·8	60	49	48	51	64	24	11	1	10	3	36	38	49	61	61	40·3	34·9	27·8	26·3	33.
3.....	114	693·5	27·7	.....	55·9	64	52	48	55	72	19	5	13	24	7	45	47	61	79	79	38·3	29·2	20·1	20·5	28·3
4.....	114	693·5	27·7	43·3	19·1	61	56	50	53	72	23	11	5	15	0	38	33	55	68	72	40·7	33·9	26·2	25·1	32·7
5.....	114	693·5	27·7	19·1	43·3	60	56	50	54	76	24	11	4	14	2	36	32	54	68	74	44·0	36·0	29·2	26·4	32·1
6.....	90	555	22·3	12·0	13·9	61	55	57	53	76	24	10	5	12	3	37	45	62	65	73	42·8	33·0	27·6	25·5	31·0

It is interesting to note that although Nos. 1 and 2 pens are practically all in one, which means a great air space, that these pens are warmer and more even in temperature than any of the other houses. Furthermore, these pens have, so far, proven to be very free from dampness. House No. 3, which has an all-cotton front, was the coldest, the mercury dropping as low as 24° below zero in February, and this house showed the greatest range in temperature, though it did not register as high as houses 5 and 6. House No. 5 has proven to be the driest up to date. House No. 6 lacks in floor space and sunshine and was not as dry as would be expected, having a straw loft.

NATURAL INCUBATION.

Table 2 shows the results of natural incubation of eggs and brooding of chicks from the individual pens.

SUMMARY OF NATURAL INCUBATION AND BROODING.

No. of Hen and Pen.	Breed.	Date hatched	No. of Eggs set.	Fertile.	Live Germs.	Fertile Hatched.	Per cent alive.		
							1st week.	3rd week.	8th week.
				%	%	%	%	%	%
Hen 1—Pen 3	Wyandotte	May 14, 1915	14	71·42	57·1	70	100	85·7	85·7
Hen 2—Pen 4	B. P. Rocks	May 14, 1915	14	64·2	64·2	77·7	85·7	85·7	71·4
Hen 3—Kentville	Wyandotte	May 20, 1915	9	88·8	88·8	100	100	87·5	87·5
Pen 1	Wyandotte	" 20, 1915	5	60	40	66·6	100	100	100
Hen 4—Pen 3	Wyandotte	May 20, 1915	14	50	35·71	57·1	100	100	100
Hen 5—Pen 1	Wyandotte	May 20, 1915	14	50	35·71	57·1	100	75	75
Hen 6—Pen 6	B. P. Rocks	May 20, 1915	14	92·85	50	46·2	100	100	100
Hen 7—Pen 2	B. P. Rocks	May 24, 1915	14	57·14	42	62·5	100	100	100
Hen 8—Pen 2	B. P. Rocks	May 24, 1915	14	64·28	50	66·6	100	100	100
Hen 9—Pen 1	Wyandotte	May 24, 1915	14	57·14	42	62·5	100	100	100

ARTIFICIAL INCUBATION.

Table 3 shows the results of artificial incubation of eggs and brooding of chicks from the individual pens.

SUMMARY OF ARTIFICIAL INCUBATION AND BROODING.

Name of Incubator and No. of Hen.	Breed.	Date hatched	No. of Eggs set.	Fertile.	Live Germs.	Fertile Hatched.	Per cent alive.		
							1st week	3rd week	8th week.
				%	%	%	%	%	%
Cyphers—Pen 1	Wyandotte	April 5, 15	140	52·14	37·8	45·21	100	84·8	63·6
Pen 2	B. P. Rocks	" 5, 15	60	70	48·3	28·57	100	75	58·3
Tamlin 24631a—Pen 2	B. P. Rocks	April 16	50	84	66	30·9	84·6	69·2	53·8
Pen 1	Wyandotte	" 16	50	36	26	22·2	100	75	75
Tamlin 3009—Pen 4	R. P. Rocks	April 16	25	44	24	45·4	100	80	80
Pen 1	Wyandotte	April 16	75	38·6	26·6	41·38	91·6	83·3	66·6
Prairie State—Pen 1	Wyandotte	April 26	150	47·3	26	25·35	83·3	72·2	55·5
Pen 3	Wyandotte	April 26	66	42·4	28·7	25	71·4	71·4	57·1
Prairie State—Pen 2	B. P. Rocks	May 8	125	80	60·8	29	89·6	68·9	51·7
Pen 6	B. P. Rocks	May 8	50	90	66	26·6	83·3	58·3	50
Pen 4	B. P. Rocks	May 8	45	88·8	75·5	35	85·7	57·1	50
Cyphers—Kentville	Wyandotte	May 8	75	88	73·3	27·27	88·2	70·5	52·9
Pen 2	B. P. Rocks	May 8	35	80	60	25	71·4	57·1	57·1
Pen 1	Wyandotte	May 8	75	57·5	30·6	51·16	86·3	81·8	72·7
Pen 4	B. P. Rocks	May 8	35	91·43	77·1	37·5	83·3	75	58·3

ARTIFICIAL VERSUS NATURAL INCUBATION.

Table 4 is made up from tables 2 and 3, giving the average percentage from each pen for the full period of incubation and brooding, making the comparison of artificial versus natural incubation and brooding more easily studied.

Breed.	No. of Pen.	Natural Incubation.				Artificial Incubation.			
		Fertility Average. %	Live Germs. Average %	Chicks Average %	Birds alive at end of 8th week. Average %	Fertility Average %	Live Germs Average %	Chicks Average %	Birds alive at end of 8th week. Average %
Wyandotte.	1	55·7	39·2	34·7	91·6	36·3	29·4	17·8	66·6
B. P. Rock.	2	60·7	46·0	39·3	100·0	78·5	58·7	22·3	55·2
Wyandotte.	3	60·7	46·4	39·3	92·8	42·4	28·7	10·6	57·1
B. P. Rock.	4	64·2	64·2	50·0	71·4	74·7	52·2	28·4	62·7
B. P. Rock.	6	92·9	50·0	42·9	100·0	90·0	66·0	24·0	50·0
Wyandotte.	K	88·8	88·8	88·8	87·5	88·0	73·3	24·0	52·9
Average..	.....	70·5	55·7	49·1	90·5	68·9	51·5	21·2	57·4

There is but slight difference in the average per cent fertility of the natural versus artificial incubation. The Barred Rocks from house 6 show a higher percentage of fertile eggs than those from house 4, and those from house 2 showed the lowest percentage of fertile eggs. Hens in house 6 received grain only; those in houses 2 and 4 received a mixture of wheat, oats and corn, equal parts by weight, fed in litter twice daily at the rate of 2 quarts per 25 birds; in addition, they had dry mash before them all the time, made up of bran and shorts, equal parts. All birds had plenty of grit and oyster shells before them all the time. Of the two breeds Wyandottes and Rocks, the Rocks gave the better returns, both from natural and artificial incubation.

Wyandottes in house 3 (all-cotton front) gave slightly better results than those in house 1, both pens receiving the same feed as did Rocks in pen 2. In the two years' tests we have gotten slightly better returns by the natural incubation, but experienced difficulty in getting sufficient hens to set early enough, and where a large number of chicks are required much more difficulty would be experienced from the natural incubation. The above results, which have been obtained during the past season, coincide with previous years' tests.

TEMPERATURE AND RELATIVE HUMIDITY.

Table 5 shows the temperature and relative humidity of the room, and of the different makes of machines at the time of incubation. The Tamlin machines are very easily regulated and do not require as much careful attention to keep an even temperature as do the other makes. It was very difficult to keep the relative humidity up in the Cyphers, much more so than in the Tamlin machines. However, all machines gave very good satisfaction.

TEMPERATURES and Relative Humidity of Machines and Rooms.

Name of Incubator.	Date.	MACHINE.		ROOM.		MACHINE.				ROOM.			
						Highest.		Lowest.		Highest.		Lowest.	
		Temperature.	Relative humidity.	Temperature.	Relative humidity.	Temperature.	Rel. Hum.	Temperature.	Rel. Hum.	Temperature.	Rel. Hum.	Temperature.	Rel. Hum.
		°	°	°	°	°	°	°	°	°	°	°	°
1. Cyphers	March 16—April 5	102·8	.....	47·9	71·5	103	.....	101·5	.....	58·0	81·0	43·0	63·0
2. Cyphers	April 17—May 8	103·0	35·2	53·0	80·5	103·0	36·0	103·0	35·0	56·0	88·0	50·0	44·0
3. Prairie State	April 5—April 26	103·0	48·5	53·7	77·0	103·5	51·0	103·0	45·0	58·0	88·0	47·0	66·0
4. Prairie State	April 28—May 19	102·9	49·5	55·8	79·0	103·5	51·0	102·0	47·0	61·0	88·0	50·0	64·0
5. Tamlin 24631a	March 26—April 17	103·8	50·7	50·5	75·0	104·5	52·0	102·5	47·0	58·0	83·0	43·0	63·0
6. Tamlin 3009	March 26—April 17	103·9	50·6	50·5	75·0	104·0	53·0	103·0	44·0	58·0	83·0	43·0	63·0

BROODING.

The room brooder gave only fair results, in that it was impossible to get the proper kind of coal to burn in it. It is impossible to run it on soft coal, which was the only kind obtainable during the first half of the brooding period. Towards the last a few bags of hard coal were procured and the difference was most marked. There is this to be said, that once one becomes accustomed to handling this type of brooder, and good coal is available it is certainly an efficient brooder and one in which a large number of chicks can be handled.

SESSIONAL PAPER No. 16

EXPERIMENTAL STATION, FREDERICTON, N.B.

REPORT OF THE SUPERINTENDENT, W. W. HUBBARD.

POULTRY.

The cold, wet spring of 1915 was unfavourable to poultry, especially to the raising of chicks. The early part of the season was very wet and cold; there were 50 wet days recorded during April, May and June.

BUILDINGS.

Three types of poultry houses are used for the accommodation of the birds. One house 48 by 12 having a capacity of 100 hens was divided into four pens 12 by 12, each pen having one glass and one cotton window together occupying two-thirds of the front of the pen. A second house 32 by 16 has a similar capacity, but is divided into two pens 16 by 16, the front of each pen being two-thirds cotton and one-third glass. Three colony houses on skids with accommodation for 25 birds each completed the housing arrangement.

A brooder house heated by a Candee Brooder stove was used for raising the chicks after they were taken from the incubators.

The poultry administration building with an incubator cellar, office, feed-room and bed-room for poultryman complete the equipment.

STOCK.

The stock at the beginning of the season consisted of 76 Barred Rocks, 59 White Wyandottes, 87 Rhode Island Reds and 56 Leghorns.

All the birds were trap nested during nine months.

The following table gives the eggs obtained from four pens and the value of eggs produced.

Breed.	No. of Birds.	Duration of Test.	Eggs laid.	Value.	Average earning per bird for 9 months.
				$ cts.	$ cts.
R. I. Red	10	9 months	1,182	31 52	3 15
B. P. Rock	10	9 "	1,118	29 81	2 98
White Leghorn	10	9 "	1,111	29 63	2 96
White Wyandotte	10	9 "	933	24 88	2 48

FEEDING.

The birds were fed oats in the morning, wheat at noon, and cracked corn at night. A dry mash consisting of 100 pounds bran, 100 pounds middlings, 100 pounds corn meal, 50 pounds alfalfa, 25 pounds oilcake (ground) was before them all the time. Grit, oyster shell, beef scrap and charcoal were at all times within reach. A small power green-bone cutter was installed and during the winter months green bone at the rate of 1 ounce per bird per day was fed to the layers, and half an ounce per bird every other day was fed to the birds in the breeding pens.

PEDIGREE WORK.

In February, pens containing twenty-five of the best layers in each breed were mated up to good vigorous males whose respective mothers were known to be good layers.

A start was also made with keeping pedigreed records of chicks. Eggs from five birds of each of the four breeds were used for this purpose; some of which were placed in a tray by themselves in the incubator and some put under hens. When the chicks hatched out they were toe punched and a record made of the punch mark or marks.

TABLE showing winter egg production of early pullets, late pullets and hens, of Rocks, Reds and Wyandottes.

Breeds.	No. of Hens.	Eggs Produced.						Eggs and Values.				Feed and Cost.						
		Nov.	Dec.	Jan.	Feb.	Mar.	Total.	Average number eggs per hen.	Average price per dozen.	Total value of eggs.	Average value of eggs from one hen per day.	Number of quarts of whole grain.	Cost at 2·87 per quart. cts.	Pounds of mash.	Cost at 1·94 cts. per pound.	Grit, shell, etc., at 0·1 cents per lb.	Total cost.	Cost to produce 1 dozen eggs.
									cts.	$ cts.	cts.		$ cts.		$ cts.	cts.	$ cts.	cts.
B. P. Rocks, early pullets	50	14	299	572	801	976	2,662	53·24	30·6	67 88	0·89	1,046	30 02	336	6 52	70	37 24	17
" late pullets	50	0	15	239	464	939	1,657	33·14	30·6	42 25	0·55	1,006	28 87	402	7 80	70	37 37	27
" hens	25	0	34	148	282	392	856	34·24	30·6	21 83	0·57	496	14 23	220	4 26	34	18 85	26
R. I. Reds, early pullets	20	7	184	299	280	371	1,141	57·05	30·6	34 07	0·96	424	12 17	190	3 68	28	16 13	17
" late pullets	20	0	0	169	233	250	652	32·60	30·6	16 62	0·54	465	13 35	206	4 00	30	17 65	32
" hens	20	31	163	185	239	330	953	47·65	30·6	21 73	0·28	431	12 36	188	3 64	30	16 31	20
White Wyandotte, pullets	25	0	42	112	230	341	725	29·00	30·6	18 48	0·49	464	13 31	198	3 83	30	17 43	29
" hens	25	0	81	123	150	252	606	24·24	30·6	15 45	0·41	456	13 08	222	4 31	25	17 64	35

FREDERICTON.

The records of the birds from which the eggs were selected are given below.

RHODE ISLAND REDS.

Record No. of Bird.	No. of Days.	No. of Eggs.	Value.	Cost of Feed.	Profit for 8 months.
			$ cts.	$ cts.	$ cts.
37	240	151	3 77	1 23	2 54
15	240	128	3 20	1 23	1 97
70	240	126	3·15	1 23	1 92
44	240	122	3 05	1 23	1 82
26	240	121	3 03	1 23	1 80
Total, 5 hens	240	648	16 20	6 15	10 05

WHITE LEGHORNS.

95	240	162	4 05	1 19	2 86
17	240	134	3 40	1 19	2 21
29	240	122	3 05	1 19	1 86
39	240	107	2 67	1 19	1 48
15	240	104	2 60	1 19	1 41
Total, 5 hens	240	629	15 77	5 95	9 82

BARRED PLYMOUTH ROCKS.

9	240	153	3 82	1 21	2 61
49	240	130	3 25	1 21	2 04
10	240	116	2 90	1 21	1 69
52	240	110	2 75	1 21	1 54
37	240	107	2 67	1 21	1 46
Total, 5 hens	240	616	15 39	6 05	9 34

WHITE WYANDOTTE.

53	240	115	2 87	1 20	1 67
14	240	104	2 60	1 20	1 40
51	240	95	2 37	1 20	1 17
26	240	94	2 35	1 20	1 15
20	240	94	2 35	1 20	1 15
Total, 5 hens	240	502	12 54	6 00	6 54

SESSIONAL PAPER No. 16

EXPERIMENTAL STATION, STE. ANNE DE LA POCATIÈRE, QUE.

REPORT OF THE SUPERINTENDENT, JOS. BEGIN.

POULTRY.

A location for the poultry plant was selected along the main road and also in full view of the main line of the Government railway. The ground on which the poultry houses were to be located was drained and a considerable quantity of gravel mixed with it, as it was quite heavy and rather damp.

It is not intended to raise poultry on a large scale, as the area of the poultry plant is small. However, adjacent cultivated fields will be utilized, and the growing stock will be given access to these fields. It will be very interesting to see if the many advantages resulting from this method, of allowing fowls the run of cultivated fields, when the poultry yards become over-stocked, will not to a large extent offset the damage caused to the crops. The destruction of numberless insects should be sufficient compensation for any damage.

BUILDINGS.

An administration building, 18 by 26, was built in the fall of 1915. This building includes a cemented incubation cellar, communicating with the outside by a door, covered on the outside with a lean-to, 6 by 8 feet and a good cement stairway. The cellar is also connected by a stairway to the first floor, on which are an office for the poultryman, and bed-room and a feed-room. The top floor is used as a feed store room. Bins for the various sorts of feeds have been placed on the top floor and the grain comes down by grain chutes to the feed room, placed right under the feed store. This is a very convenient arrangement.

A permanent poultry-house, 16 by 32, was built in the fall on a good cement foundation with a cement floor. This poultry-house is divided in two by a partition. There are two pens 16 by 16, each being able to accommodate 50 hens, allowing 5 square feet to each hen, which is sufficient for a cold poultry-house. This poultry-house has a shed roof with t. and g. boards 1⅛-inch thick. A good brand of steel shingles was used in this building. The front of the poultry-house is composed of two-thirds of cotton and one-third glass, or exactly 78 feet in glass, 120 feet in cotton, and 58 feet in wood (bottom board, studding, window frame, and trimmings). The house is 8 feet high at the front between the floor and the plate, and 4 feet 6 inches at the back, affording the roof a sufficient slope. The sides and the back, at the north, are covered with one ply of board, 1-inch thick. The inside is fitted as follows: double roosts above a dropping board, one row of trap nests under the board, a supply bin and self-feeding hopper, in each pen, etc. This poultry-house is very convenient and satisfactory.

Six colony houses, 8 feet by 12 feet, were completed in March; they will be used for breeding purposes. All these houses are of the same size, the front is of cotton, with more or less glass.

EQUIPMENT.

Our breeding equipment is quite modern, including three incubators, latest models, with a capacity of 140 to 300 eggs, as well as artificial brooders, adaptable to colony-houses.

STOCK.

One breed only will be kept, the White Wyandotte. This variety was selected because it seems to be the most popular variety in this neighbourhood.

Seventy-five pullets and twenty-five hens of high quality and very good breeding were purchased as foundation stock for the Station, and it is proposed to start breeding in the spring, with a view to double this number in the fall.

The flock has wintered very well, although the winter was very severe in our district; the egg yield for the three months of winter has been very encouraging and gives us the best hopes for the future.

EXPERIMENTAL STATION, CAP ROUGE, QUE.

REPORT OF THE SUPERINTENDENT, GUS. A. LANGELIER.

POULTRY.

Barred Rocks only are kept because it is the prevalent breed in the district and it was thought that farmers' flocks could thus be more quickly improved than if another had been chosen. A couple of hundred hens and pullets were wintered but the number will be brought up to three hundred. The stock was very healthy all through the year and the average percentage of mortality amongst the old birds did not reach 5 per cent. A great number of chicks, however, were taken away by crows, hawks, foxes, skunks and weasels. The death rate amongst the youngsters was very low, but nothing weak was taken from the incubators to the brooders, as it is a loss of time and money to do so. The intention is to raise about six hundred chicks each year, and to choose the best two hundred pullets out of these to replace the one hundred breeding stock, and one hundred of the pullets each year. These pullets will be forced for winter egg production, whilst the yearling hens will be kept for breeders.

INCUBATORS.

A twelve hundred egg coal-burning incubator has been installed. It is divided into four compartments, each of which has its thermostat, besides the regulator which opens or shuts the damper of the stove according to how the temperature is. This style of machine for large quantities of eggs is a great time saver as there are no lamps to attend to, and, because of this it gives better satisfaction than the small oil machines which were tried previously. It has been found advantageous to regulate the humidity in the incubator cellar as well as in the machine; this is done by opening or shutting ventilators of the Rutherford type, according to the size of the air space in the eggs. The chicks are generally left a couple of days in the incubator before being removed to the brooder.

BROODERS.

Two coal-burning brooders have been installed. One of them is a coal stove and can be operated in a colony house because it has a capacity of from two hundred to four hundred chicks. The other brooder is the "pipe system" and is installed in a permanent house. The brooder has a capacity of about seven hundred chicks. Both give perfect satisfaction, the temperature is easily controlled, and a return to the lamp machines would not be made for a great deal. In fact, there is so much difference between the two that the coal-burning brooder will probably in many places take the place of the oil machine in the not distant future.

BROODING AND FEEDING.

When the chicks are brought to the brooders, the temperature is kept high for a few days, about 100°, and gradually brought down as the youngsters get older. This is important, as a sudden drop of ten or fifteen degrees is too much. Care is also

taken not to overfeed at first, as a great deal of mortality amongst very young chicks is due to this. If some rolled oats are kept constantly in a hopper where the youngsters can get at them, there is no fear of bad results from underfeeding.

BUILDINGS.

The plant is now practically completed and comprises an administration building, where are the incubator, feed, egg, killing, mixing, and storage rooms, two permanent poultry houses for one hundred hens each, five movable colony houses which can respectively accommodate from ten to twenty birds, and a brooder house for about seven hundred chicks. There are no frills in these constructions. They were put up in a substantial way, with a view to minimize the repair and depreciation accounts. The poultry houses, both permanent and movable, are constructed exactly as recommended to farmers, so that besides sheltering the stock, they serve as an object lesson to visitors.

GROUNDS.

What is here called the poultry area consists of about five acres of rough untillable land, one-half of which is covered by maples. It is admirably adapted to poultry raising, as the soil is always dry, there is lots of shade, the strongest winds from the northeast are stopped by the woods, and there are a couple of acres of sod affording green food for a very long period each year. A strong wire poultry fence, suitable for keeping growing and adult stock, encloses the whole area. In addition to this, netting is placed around the part devoted to the young chickens. After these are from six to nine weeks old, according to the season, they leave the brooder house and are placed in colonies, the cockerels being separated as soon as possible from the pullets.

Movable fences divide the yards to the south of the two permanent houses, and, when the breeding season is over, they are taken away, everything being then ploughed up and seeded to oats. The old stock for the summer run together in a large park north of the main building.

TEMPERATURE IN WIDE VERSUS NARROW HOUSE.

The two permanent poultry houses are built exactly on the same lines, cotton on front shed structures, and have the same floor space, the only difference being that one is 16 feet wide and the other only 12. Of course, the latter is longer, but the pitch of the roof, the interior arrangement, the proportion of cotton and glass to the whole front are exactly the same. A maximum and minimum thermometer was placed in each building and the temperature recorded from November 26, 1915, to March 31, 1916. An instrument of the same description is also kept outside for the Dominion Meterological Office. The following table shows that though the curtain fronts were not closed more than a dozen times through the winter, the temperature was much higher inside, and fluctuated a little less in the wide house.

TEMPERATURES Outside, and in Wide and in Narrow House, November 26, 1915, to March 31, 1916.

	Lowest. ° Fahrenheit.	Highest. ° Fahrenheit.	Extreme Weekly Range. ° Fahrenheit.
Outside	—27	44	38·69
Wide House	— 5	43	11·87
Narrow House	— 7	43	14·06

CAP ROUGE.

WINTER LAYERS OF DIFFERENT AGES.

It is thought that many farmers keep hens until too old for profitable winter egg production, and it is also a common belief that late hatched pullets commence to lay only in the spring. An experiment was thus planned to see if it is really more profitable to use yearling hens and early hatched pullets for winter egg production. Four lots of twenty-five birds each were used: (1) Hens two years and over; (2) yearling hens; (3) pullets hatched before May 15; (4) pullets hatched after May 15. The hundred birds occupied the four pens of a 42 by 12 cotton-front shed-roof house. All feed was weighed, and all eggs were counted and placed on scales for each pen. The experiment commenced on November 18 and finished on February 29, a period of 104 days. The following table shows the results:—

WINTER Layers of Different Ages.

—	No. of Eggs laid.	Total weight of Eggs laid.	Average weight per doz.	Average price per doz.	Total value of Eggs.	Value of Feed consumed.	Loss or Gain per pen.	Loss or Gain per hen	Cost of one doz. Eggs.	Cost of one lb. Eggs.
		Oz.	Oz.	Cts.	$ cts.	$ cts.	$ cts.	Cts.	$ Cts.	Cts.
Early pullets.....	955	1,893	23·7	44·9	35 72	13 34	22 38	89	16·7	11·3
Late pullets.....	545	1,032	22·7	44·5	20 33	12 86	7 36	29	28·2	19·9
Yearling hens....	154	338	26·3	43·5	5 58	12 22	— 6 64	—27	95·1	57·9
Old hens	16	37	27·6	41·2	0·55	11·68	—11 13	—15	3·76·0	505·5

Twenty-five early pullets gave over cost of feed in 3½ months, $22.38. The late pullets $7.36, the yearling hens lost $6.64. The old hens lost $11.13.

The price received for one dozen of eggs from the early pullets paid for the feed necessary to produce 2¾ dozen eggs, while the price received for three dozen eggs laid by the old hens would be all eaten while they were laying one egg and a half.

The late pullets paid a profit, but only the early pullets should be kept for winter eggs.

This experiment will be continued during four more winters, and whilst it is admitted that old hens may do better another year, it seems quite clear, from one season's trial, that pullets, especially early ones, are the most profitable winter egg producers.

To find out if heavy winter laying has any effect on the fertility and hatchability of eggs, also on the livability and vitality of chicks, fifteen of each of the twenty-five birds in the four pens were mated to strong cockerels and their eggs will be hatched separately and the chicks toe-marked.

EXTENSION WORK.

The Central Experimental Farm, Ottawa, has undertaken extension work in a radius of some 10 miles from the Farm. Over thirty farmers are keeping records of the feed given and of the products obtained. This has had a very good effect, and it is expected that Cap Rouge will soon be the centre of a good poultry district. Over one thousand eggs for incubation, and some fifteen cockerels were sent to the members of this survey work and to Illustration Stations in the province of Quebec, which will no doubt improve the poultry stock kept in the localities where they were shipped.

CAP ROUGE.

SESSIONAL PAPER No. 16

EXPERIMENTAL FARM, BRANDON, MAN.

REPORT OF THE SUPERINTENDENT, W. C. McKILLICAN, B.S.A.

POULTRY.

In presenting the following report of the poultry work on Brandon Experimental Farm during the past year, I wish to give credit to my assistant, Mr. W. H. Hicks, B.S.A., who has had general supervision, under my direction, of this department, and who has done most of the work of preparing the report.

THE STOCK.

The poultry flock consisted of the following birds on March 31, 1916:
Barred Plymouth Rocks: 30 pullets, 30 hens, 4 cocks.
White Wyandottes: 30 pullets, 48 hens, 9 cocks.

THE EQUIPMENT.

The poultry department on this Farm is gradually assuming larger proportions. During the last year the equipment has been enlarged. A new one-story administration building was built during the summer of 1915. The basement is used for an incubation cellar and egg room, and the ground floor for office, bed-room, and feed-room. A building of this nature at the poultry plant is of much assistance in saving labour. The poultryman is always on the job, and is enabled to do much more efficient work in manipulating the trap nests, incubators, and brooders. Crows, hawks, weasels, and ground squirrels did considerable damage to young chicks. The nearness of this building will assist the man in charge to keep down these pests.

THE BROODERS.

So far, the cotton-front houses have been used for brooder purposes. Though they are warm enough for laying hens they are not entirely satisfactory as brooders, especially for early chicks. Owing to the lack of insulation it is very difficult to keep sufficient heat around the chicks. With the assistance of blankets and boards, a covering has to be made which helps in holding the heat close in to the hover. Such a building should make a satisfactory brooder home if it were constructed a little more warmly than ours.

INCUBATION.

Four incubators—one hot air and three hot water—with a combined capacity for 464 eggs, did the hatching, and gave good satisfaction.

The following table gives the results obtained from three different makes of incubators during the total season's hatch. The season extended from March 24, when the first incubator was set, until June 1.

Summary of Incubation Records.

Name of Machine.	Total set.	First Test.			Second Test.		Total hatched.	Cripples.	Put in Brooder.	Per cent of total eggs hatched.	Per cent Fertile eggs hatched.	Per cent hatched of eggs left in after second test.
		Infertile.	Blood rings.	Left in.	Dead germs.	Left in.						
1. Cyphers (hot air)	429	47	21	361	50	311	237	8	228	55·2	62	76·2
2. Tamlin's (hot water)	626	89	12	516	61	452	336	32	304	53·6	62·5	74·3
1. Brett (hot water)	233	38	4	191	30	171	121	8	113	51·9	62·0	70·8

Brandon.

DAY-OLD CHICKS VERSUS BREEDING EGGS.

In conjunction with the Central Experimental Farm at Ottawa and other Experimental Farms and Stations a test was made to determine the relative satisfaction in shipping day-old chicks and breeding eggs. This farm co-operated with Ottawa and Lacombe, Alta.

One hundred eggs were placed in an incubator at Ottawa. One hundred similar eggs were shipped by express from Ottawa to this Farm on the same date. The eggs were placed in an incubator upon arrival here. When the eggs at Ottawa were hatched, the chicks were shipped here by express. This same experiment was duplicated with the Lacombe Station. At the same time similar lots were started here and shipped to Ottawa and Lacombe.

SHIPPING Eggs for Hatching versus Day-old Chicks.

Shipped from	Breed.	Date of Arrival.	Condition on arrival.	Cost of Transportation.	Method of Transportation.	Alive, June 19	Alive 2 weeks.	Alive 1 month.
Ottawa—100 eggs to be hatched at Brandon...	Barred Rocks...	May 28.....	Weak germs, many infertile.	$1 65	Dominion Express.	35	25	20
Ottawa—Chicks from 100 eggs hatched at Ottawa.	Barred Rocks..	June 19.....	1 cripple, rest in good condition.	0 70	Dominion Express.	22	12	10
Lacombe—100 eggs to be hatched at Brandon.	Barred Rocks..	April 23....	Four broken.....	1 20	Dominion Express.	Alive, May 17, 42	36	6 30 were burned in a brooder.
Lacombe—Chicks from 100 eggs.....	Barred Rocks..	May 17.....	Good.....	0 70	Dominion Express.	37	2	2

Shipping the eggs and hatching them at their destination gave much better results than shipping the day-old chicks. The distance the chicks had to travel in each instance was considerable, Brandon being about one thousand miles from Lacombe, and thirteen hundred from Ottawa. Further work along this line on shorter distances should give some interesting results.

SUMMER ARRANGEMENT.

When the breeding and hatching season was over, the hens were allowed to run together. With the use of the hopper feeders, the work and care in connection with looking after them was cut down to a minimum. The cocks were crate-fattened and killed. The chicks were given plenty of range. As soon as the cockerels could be distinguished from the pullets, they were separated. All females that had passed their second laying season were marketed during the summer. Any weak, small birds, or those otherwise unfit for breeding, were also disposed of. Twenty-four of the cockerels were crate-fattened in the fall to see if sufficient gains could be made to pay for the feed consumed. After a three-weeks' fattening period, they showed a gain of 22½ pounds. The 22½ pounds gain at 18 cents per pound gave a value of $4.05. The feed consumed consisted of a mash made of water and one part ground barley, one part ground and sifted oats, and one part ground wheat. Valuing this at 1 cent a pound it cost $1.14 to feed the birds, and a gain of $2.91 on the twenty-four birds was made. The crate-fattened birds were much better quality than those not receiving this finish. A wider ration mixed with skimmed-milk would no doubt have given better results.

THE COLONY HOUSES.

Six portable cotton-front houses 10 feet by 12 feet are used for housing the birds. In summer, with the cotton fronts up, they furnish cheerful, airy quarters. In the winter the birds are supplied with plenty of light, pure air, dryness, and exercise. The houses were moved into a well sheltered spot in the fall and placed in line, as close together as possible, facing the south. A self-registering thermometer was placed in each house and a record of the temperatures kept. The houses were numbered from the west to the east, No. 6 being the most exposed. Although the houses are all of the same type, they are somewhat different in construction. The following description indicates this difference:—

No. 1. One ply of boards and tar paper on outside of studs; double the amount of glass that is used in the other houses; one-third of the front is glass and two-thirds cotton.

No. 2. Tar paper and one ply of boards with an extra ply of boards on the back.

No. 3. Double-boarded outside of studs all over with tar paper between boards.

No. 4. Tar paper and one ply of boards on the outside of studs and one ply of boards on the inside of studs, but only around the roosts.

No. 5. Same as No. 2.

No. 6. One ply of boards on outside of studs and one ply on inside of studs.

The following table is representative of the temperature records observed during the winter.

Records of Temperature in Colony Houses, 1916.

House No.	1.		2.		3.		4.		5.		6.		1	
No. of Birds in House.	30		30		30		22		30		26		Outside Temperature.	
Date.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
	°	°	°	°	°	°	°	°	°	°	°	°	°	°
Jan. 1....	5	28	4	28	0	27	−11	22	− 4	25	− 2	26	−32	−10
" 3....	14	27	4	14	6	17	− 4	12	2	16	3	16	−20	3
" 5....	8	35	− 4	24	− 1	24	−12	18	− 5	20	− 4	20	−30	−23
" 7....	12	18	0	14	2	16	− 8	12	0	14	− 4	8	−21	− 3
" 9....	19	31	8	20	10	20	0	16	7	22	2	18	−12	− 8
" 13....	−24	6	−18	14	−16	14	−32	6	−22	10	−22	8	−51	−33
" 14....	−14	22	−16	20	−11	24	−24	13	−16	20	−18	16	−42	−23
" 24....	12	23	8	24	11	26	4	20	10	25	8	24	−11	−10
" 26....	− 4	32	− 6	10	− 2	17	−12	12	− 6	16	− 8	12	−23	−11
" 31....	− 6	21	−10	24	− 6	26	−18	17	−10	22	−10	20	−32	− 3
Feb. 2....	4	36	0	32	4	30	− 7	28	0	32	0	36	−20	− 9
" 4....	2	27	− 3	22	1	22	− 9	20	− 6	24	− 2	26	−27	− 1
" 10....	− 3	4	− 6	7	0	22	−12	2	− 6	10	− 6	6	−38	− 5
" 16....	28	39	31	40	34	40	30	41	31	40	30	40	26	41
" 17....	21	28	31	43	34	46	30	44	30	43	30	42	24	33
" 20....	18	26	22	34	26	36	17	26	20	38	22	36	17	23
" 22....	11	42	18	48	22	48	12	46	17	46	18	49	− 8	18
Mar. 1....	.....	.....	−16	25	−11	24	−23	20	−18	22	−14	23	−38	− 6
" 2....	.....	.....	−12	29	− 8	28	−18	26	−14	28	−10	28	−32	1
" 11....	.....	.....	28	30	22	31	26	30	28	30	28	30	9	30

No. 1. This house proved most unsatisfactory. When the sun came out in the daytime the house would heat up quickly. The birds would bask and then at night would be very cold.

No. 2. This house gave very good satisfaction. It was hardly as warm as some of the rest, but the birds wintered well and showed no discomfort.

No. 3. This was the warmest house of all. This may have been partly due to its being in the centre of the row and therefore well protected and to having sufficient birds in it.

No. 4. This house proved very unsatisfactory. The birds found the roosts were the warmest place and stayed there most of the time during cold weather. They would huddle around the corners and could not be induced to exercise themselves sufficiently. There were only twenty-two birds in this house, but even with more the results have been the same.

No. 5. This house gave practically the same results as No. 2.

No. 6. This house gave good satisfaction. It was always dry and had the least range in temperature. No. 3 compared very favourably with it. Both these houses have two-ply of boards all over, and give good satisfaction.

TRAP NEST.

All pullets and one-year-old hens of both breeds were trap nested from November, 1915, to March 31, 1916. This is the only satisfactory method of improving the egg-laying qualities of a flock. The trap nest is to a flock of poultry as the scales and Babcock test are to a dairy herd. This is the first season that trap nesting has been

carried on extensively here. No records have been made, but the eggs from the best layers are being incubated and the foundation for a better laying strain is being built. The birds in pen No. 2, consisting of thirty white Wyandotte pullets, laid the most eggs per bird of any pen. The first pullet to lay, No. 23, started on November 28. The best layer in the whole flock, No. 5, was in this pen. She laid her first egg on December 1, and in the following 122 days laid 81 eggs, or one egg every 1½ days.

Compare pullet No. 5 with pullet No. 12 which, under the very same conditions of feeding, housing, breed and age, did not lay a single egg from the time she was hatched to March 31, and yet No. 5 is no better looking bird than No. 12. The value of a bird must be figured, not only upon the number of eggs she lays, but also upon the time of year she lays them.

In pen No. 3 the first Barred Rock pullet began to lay on December 19. The pullet laying the most eggs in this pen is No. 32. She did not lay in November or December but had 49 eggs to her credit by March 31. Three pullets in this pen did not lay at all.

In pen No. 4, White Wyandotte one-year-old hens, the second best layer of the flock is found. She laid every month, and although she had only a total of 64 eggs, she compares favourably with pullet No. 5, as she laid better in the early winter. The third best layer of the flock is also found in this pen, her number being 77. She laid 59 eggs up to March 31. Hen No. 74 in this pen did not lay at all.

The Barred Rock hens in pen No. 5 were the poorest layers. No. 12 laid 10 eggs in December, and had a total of 41 at the end of March. Several hens in this pen did not lay.

Cost of Production for Pullets, Yearlings and 2-year-old Hens for 5 months,

November to March.—White Wyandottes.

—	No. of eggs laid.	Average weight per dozen.	Average price per dozen.	Total value of eggs.	Value of feed consumed	Gain per pen.	Gain per hen.	Cost of 1 dozen eggs.
		lb. oz.	cts.	$ cts.	$ cts.	$ cts.	cts.	cts.
Pullets	787	1 9	51	29 23	13 37	15 86	52·8	20·3
Yearlings	554	1 10	51	19 51	10 80	8 71	39	23·4
Two years	351	1 10	51	12 35	10 29	2 06	5·5	35·1

The above comparison shows that for winter egg production pullets are much more profitable than hens.

EXPERIMENTAL FARM, INDIAN HEAD, SASK.

REPORT OF THE SUPERINTENDENT, W. H. GIBSON, B.S.A.

POULTRY.

Two breeds are kept, namely, Barred Plymouth Rocks and White Wyandottes. The breeding flock consists of the following:—

White Wyandottes: 9 cockerels, 30 hens and 99 pullets.

Barred Plymouth Rocks: 8 cockerels, 20 hens and 52 pullets.

Pullets and hens are housed separately, and careful records kept of the feed consumed and number of eggs produced by each pen.

To maintain the high standard of the flock, one hundred Wyandotte and Barred Rock pullets of a laying strain were received from Eastern Canada.

During the winter months a number of cockerels were sold throughout the province for breeding purposes.

THE ACCOMMODATION.

Preparations are being made to carry on more extended work with poultry. During the year a permanent site was located and laid out. A permanent house 16 feet by 32 feet, large enough to hold one hundred laying hens, was erected. The poultry plant at present consists of one permanent house, four colony houses, two of which are large enough for twenty-five hens each and the other two having accommodation for forty hens each, two small houses and one brooder house

INCUBATION.

All chicks are hatched by incubators, of which we have three, namely, Tamlin, Prairie State, and Cyphers. These continue to give good success. During the season two hundred and twenty-two chicks were hatched. One hundred and forty-four were brought through to the laying stage.

THE COST OF PRODUCING EGGS.

To ascertain the cost of feed required to produce a dozen eggs and the margin between the cost price and the selling price a small experiment was conducted with a pen of pullets here.

The test lasted for six months—November 1 to April 30. The pullets were White Wyandottes that had been shipped from Quebec and placed in one pen of a farmer's poultry house.

TABLE Showing Financial Record for One Pen of Birds.

Month.	Eggs laid.	Average weight per dozen.	Average price per dozen.	Total value of Eggs.	Value of Feed consumed	Gain per Pen.	Gain per Hen.	Cost of 1 dozen.
	No.	ozs.	cts.	cts.	$ cts.	$ cts.	$ cts.	cts.
November	333	24	32	8 88	4 65	4 23	18·4	16·7
December	324	24	35	9 45	4 63	4 82	12·6	17
January	192	24	40	6 40	4 22	2 18	5·7	26
February	296	24½	40	9 86	4 95	4 91	12·9	19
March	420	25	25	8 75	4 32	4 43	14	12·3
April	372	25½	20	6 20	5 09	1 11	2·9	16·4
Totals and Averages..	1,937	24½	32	49·53	27·86	21·68	11·1	17·9

The egg yield was by no means large, but what might be expected from an average farm flock properly managed.

January was the month of lowest production and the highest cost per dozen. March gave the highest production and the lowest cost. January and February gave the highest price for the eggs and the eggs increased in size as the time passed.

The average price received for the eggs was 24½ cents and the average cost of feed to produce one dozen of eggs was 17·9 cents.

The pen of thirty-eight birds gave a profit over cost of feed of $21.68 for the six months.

INDIAN HEAD.

EXPERIMENTAL STATION, LETHBRIDGE, ALTA.

REPORT OF THE SUPERINTENDENT, W. H. FAIRFIELD, B.S.A.

POULTRY.

The plant was increased in the summer of 1915 by the addition of three portable 50-hen houses and one small colony house. The additions to the equipment have been two Prairie State incubators and a Candee coal brooder stove.

POULTRY HOUSES.

The housing accommodation for the stock consists of:—

One permanent hen house, 16 by 32 feet, for 100 hens.
Four portable hen houses, 16 by 16 feet, 50 hens each.
One portable hen house, 14 by 16 feet, used for cockerels.
Two colony houses, 6 by 8 feet.
One brooding house, 14 by 28 feet.

The last mentioned was constructed according to plan of the Simplex Brooder Company.

ADMINISTRATION BUILDING.

In addition to this there is an administration building, 18 feet by 24 feet, with basement used for incubators, egg-room, etc., first floor used for office and feed room, and second floor used for storage room and sleeping accommodation for attendant.

TYPES OF HOUSES.

The poultry houses are all of the shed roof and cotton front type. The east and west sides have one-inch boarding. The north side is double boarded and papered, this double boarding extends round the sides a distance to correspond with the width of the drop boards, i.e., 4 feet. The south side has 2 feet of boarding along the bottom as a protection against draughts. The remainder of the front is cotton and glass, about 80 per cent cotton and 20 per cent glass. The roof has one-inch board, paper and shingles. The cotton is tacked on movable frames made of 1-inch by 2-inch lumber. In the summer these frames are taken out and 1-inch mesh poultry wire substituted, which makes the house cool and comfortable. On warm and sunny days in winter some of the cotton-covered frames are removed to give the birds all the sunshine and ventilation possible. A cotton curtain is lowered from the roof to the drop board on very cold nights. With one exception the houses have earth floors.

Although the outside temperature was as low on one occasion as 26 degrees below zero, the birds at all times seemed comfortable and had a healthy appearance. The coldest house was the one with a board floor, the thermometer registering 4 degrees colder than any of the houses with earth floors.

The feed consisted of a dry mash kept before the birds the whole time composed of:—

2 parts ground wheat.
2 " " oats.
2 " " barley.
2 " " peas.
2 " " bran.

In addition to this the birds were fed as much wheat as they would eat up clean twice daily and a wet mash was fed occasionally composed of the same ingredients as the dry mash. The birds received as a rule one half an ounce daily of green ground bone each, but this was frequently not obtainable. The green feed used was chiefly swede turnips with occasionally a few alfalfa leaves.

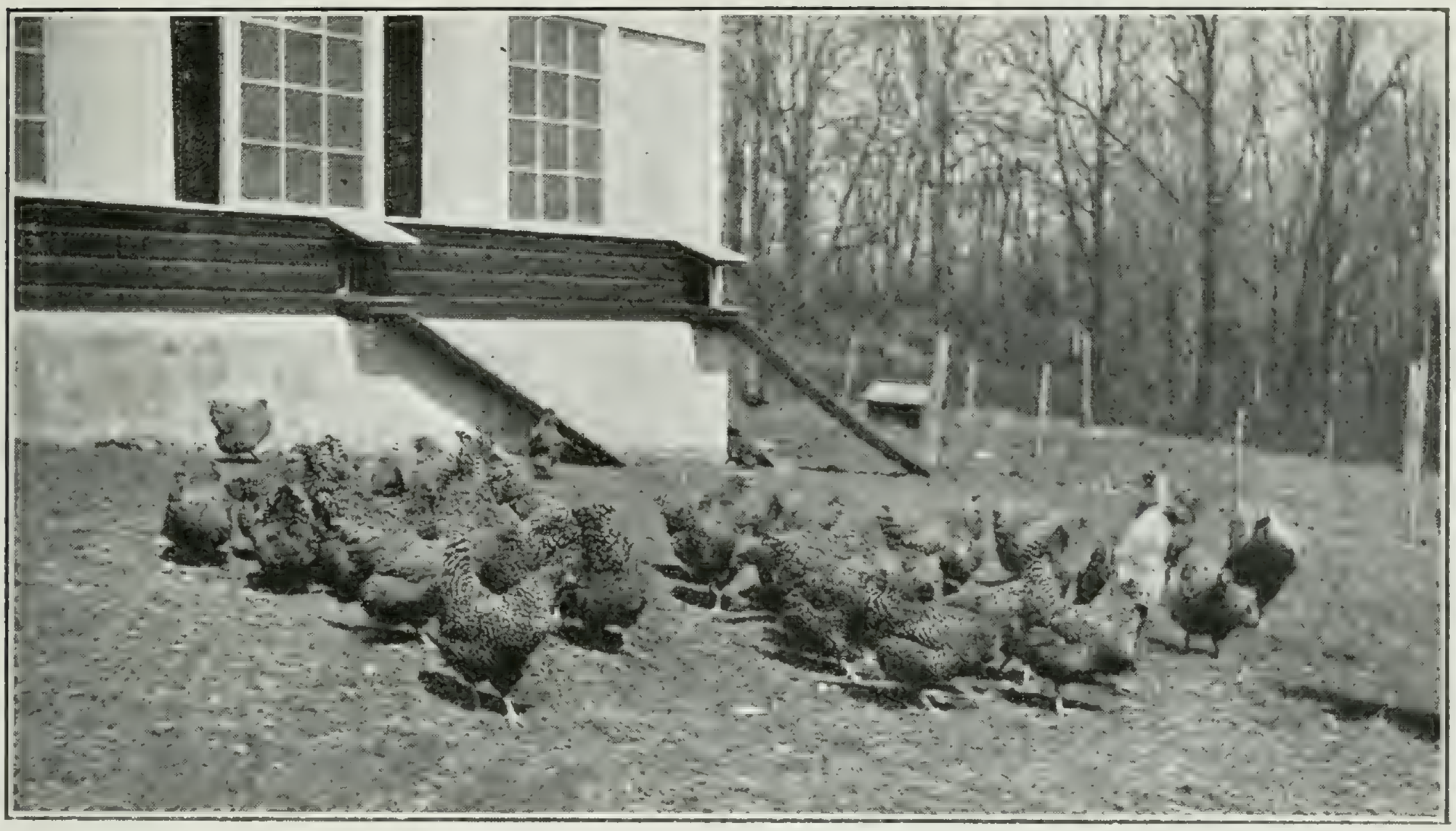
The pullets were all trap nested and a record kept of each pullet's lay.

INCUBATORS.

The incubators used for the 1915 hatch consisted of the following:—

1 Tamlin, 100 egg capacity.
1 Cypher, 144 "
1 " 244 "
3 Prairie S. 144 "

The following table will give some idea of the work of each incubator. Owing to the fact that the number of hens in some cases were so few that eggs had to be kept as long as sixteen days before use and also that this was the first season's work in the present incubator room, no very definite conclusions can be drawn from the comparative standing of each incubator.



A breeding pen at Cap Rouge, Que.



No. 16a.—Breeding pen.—White Wyandotte Pullets, Lacombe. See Laying Record Chart.



No. 15—Breeding pen—Pekin Ducks, Lacombe, Alta.

DAILY EGG RECORD

EXPERIMENTAL FARM — POULTRY DIVISION

24 Pullets. Lacombe

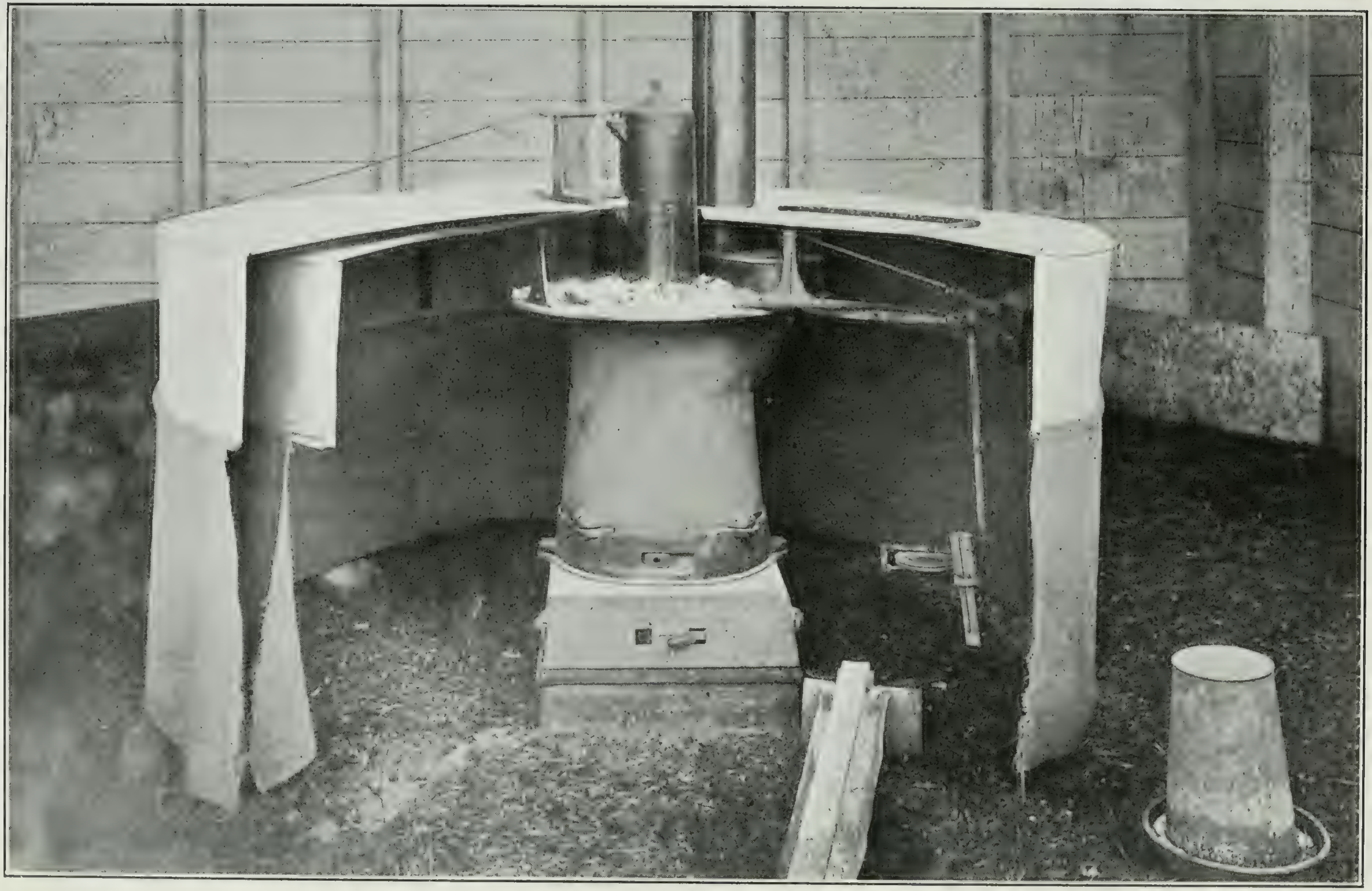
Pen No. 1. BREED White Wyandottes Month December 1915

HEN NO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	TOTAL
27	/	/	-	/	/	-	/	/	-	/	-	/	-	/	-	/	-	/	-	-	-	/	/	-	/	-	/	-	/	-	-	16
28	/	/	-	/	/	-	/	/	/	-	/	/	-	/	/	-	-	/	/	/	/	/	/	/	-	/	/	-	/	/	-	22
31	/	-	-	/	/	-	/	/	-	/	-	/	/	-	/	/	-	-	/	/	-	/	/	-	/	/	-	/	/	-	/	19
25	/	/	/	/	/	-	/	/	/	/	/	/	-	/	-	-	-	/	/	/	-	/	/	-	-	/	/	/	/	/	-	22
16	/	/	/	/	/	/	-	/	/	-	-	/	-	/	-	/	-	/	/	/	-	/	/	/	-	-	/	/	/	-	/	21
33	/	/	-	/	/	-	/	/	/	-	-	/	-	/	/	-	/	/	-	/	/	-	/	/	-	/	-	/	/	-	/	20
3	/	/	-	/	-	/	-	-	-	/	-	/	-	-	/	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7
24	/	-	/	-	/	-	/	-	/	-	/	-	/	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8
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11	/	-	/	-	-	/	/	/	/	-	-	/	-	/	/	-	/	/	-	/	/	/	-	/	-	-	/	/	-	-	/	18
30	/	-	/	/	/	/	-	/	/	/	/	/	Broody																			11
19	-	/	/	-	/	/	-	-	/	/	/	/	-	/	-	/	/	-	/	/	/	-	/	/	-	/	/	-	/	/	-	20
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44	-	-	/	/	-	/	/	-	-	/	-	/	/	-	/	-	-	/	-	-	/	/	-	/	/	-	-	-	/	-	-	14
TOTAL	14	14	15	18	16	13	13	16	15	16	8	20	12	9	14	10	9	13	10	12	10	14	9	12	9	10	10	12	14	7	11	385

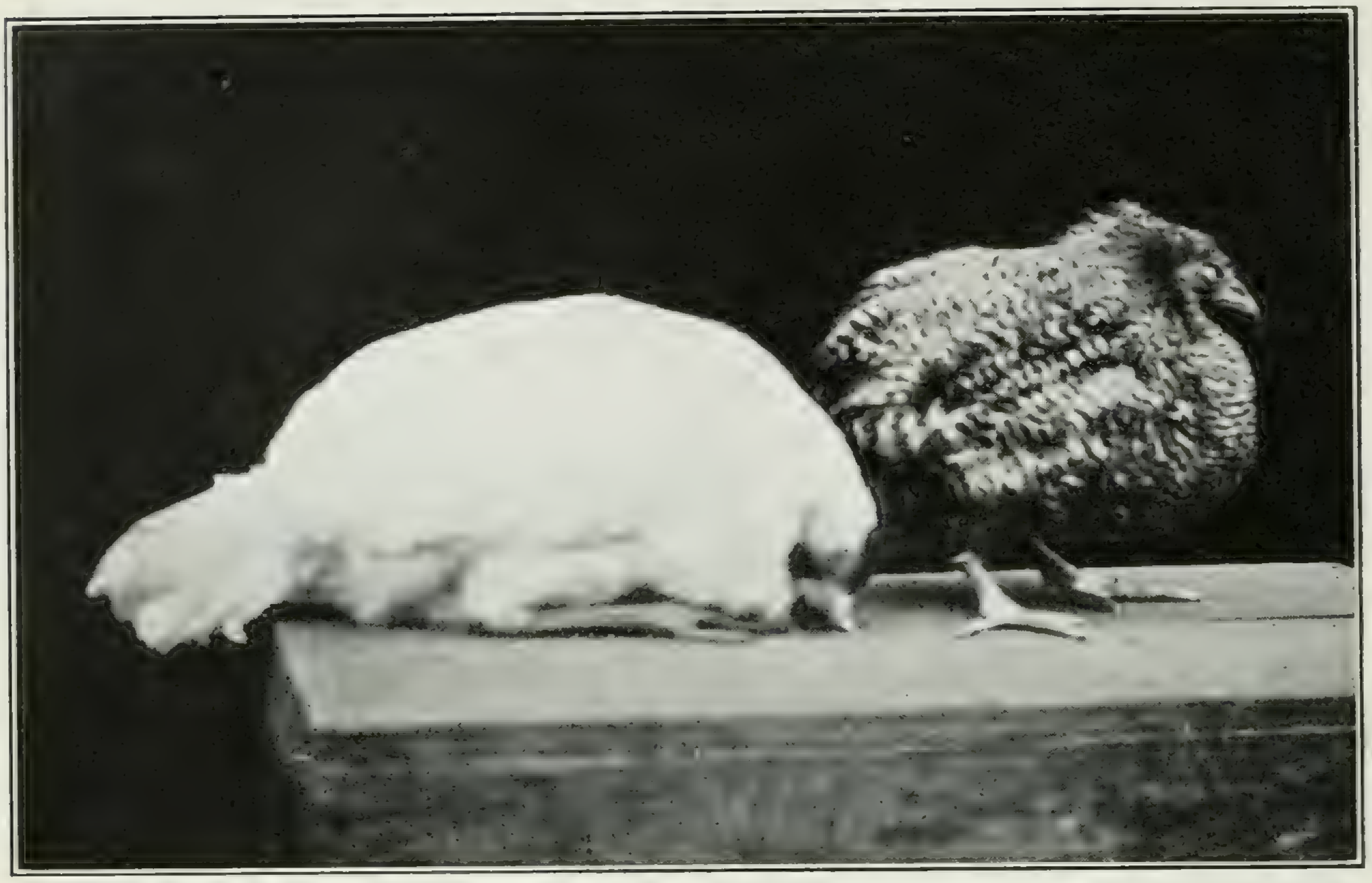
No. 18.—Egg laying record of Pen 1 White Wyandotte Pullets, Lacombe. Note regular rhythm of best layers.



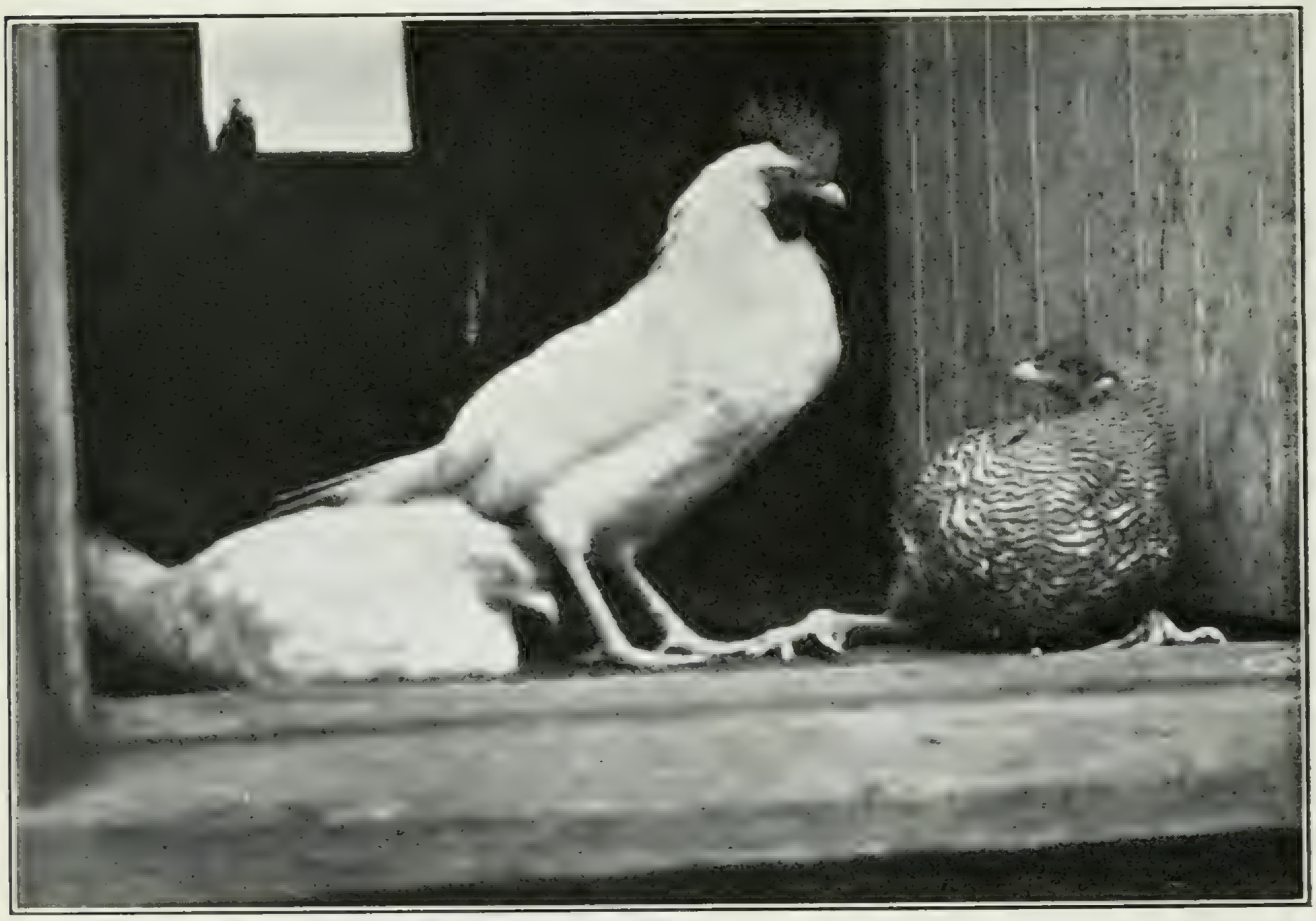
Agassiz, B. C. Poultry Administration Building. Incubator, egg and fuel room in basement. Feed and work room, office and record room, and bed room on first floor, and feed storage in attic.



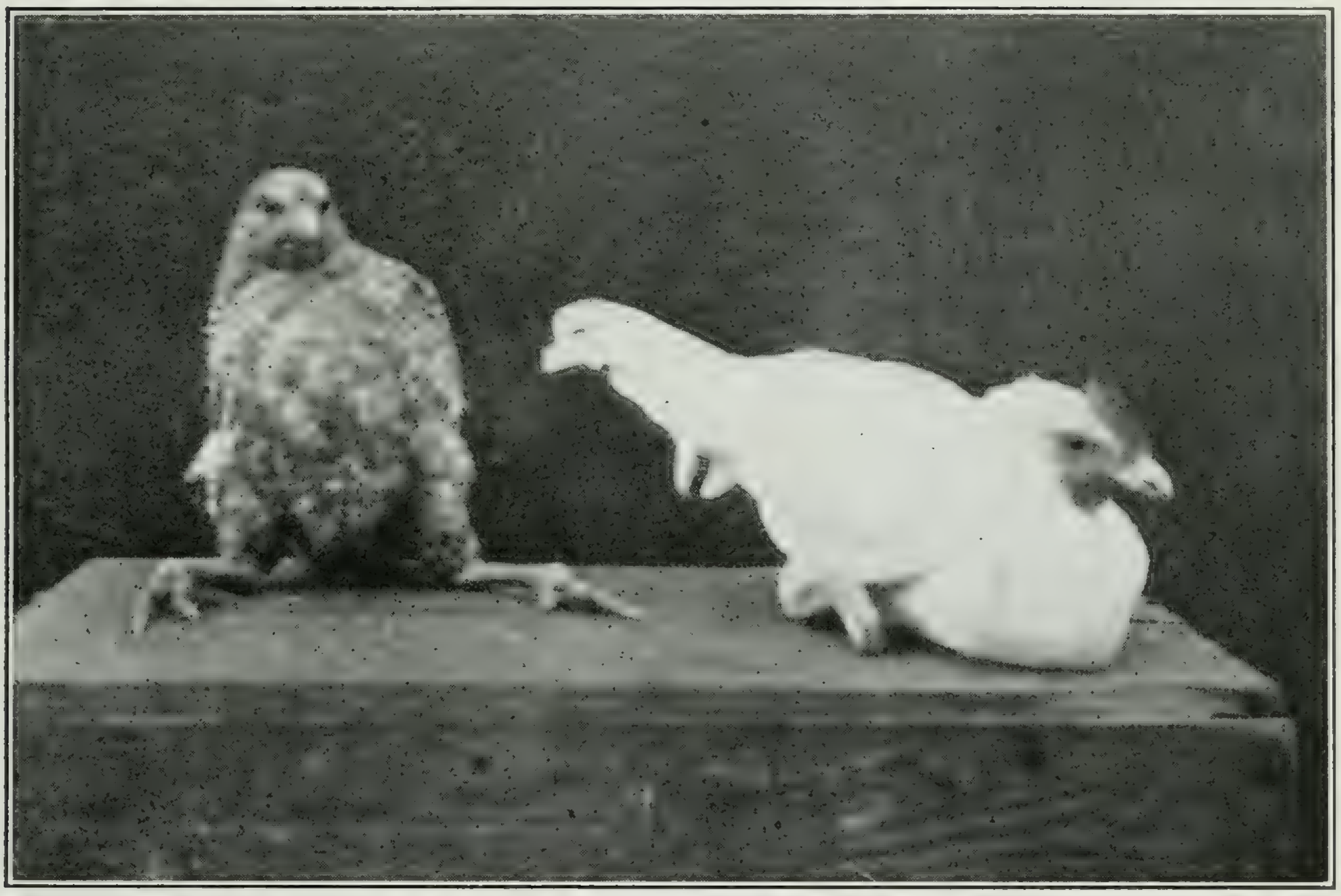
Room Brooder. Type of brooder stove successfully used for past two years. Agassiz, B.C.



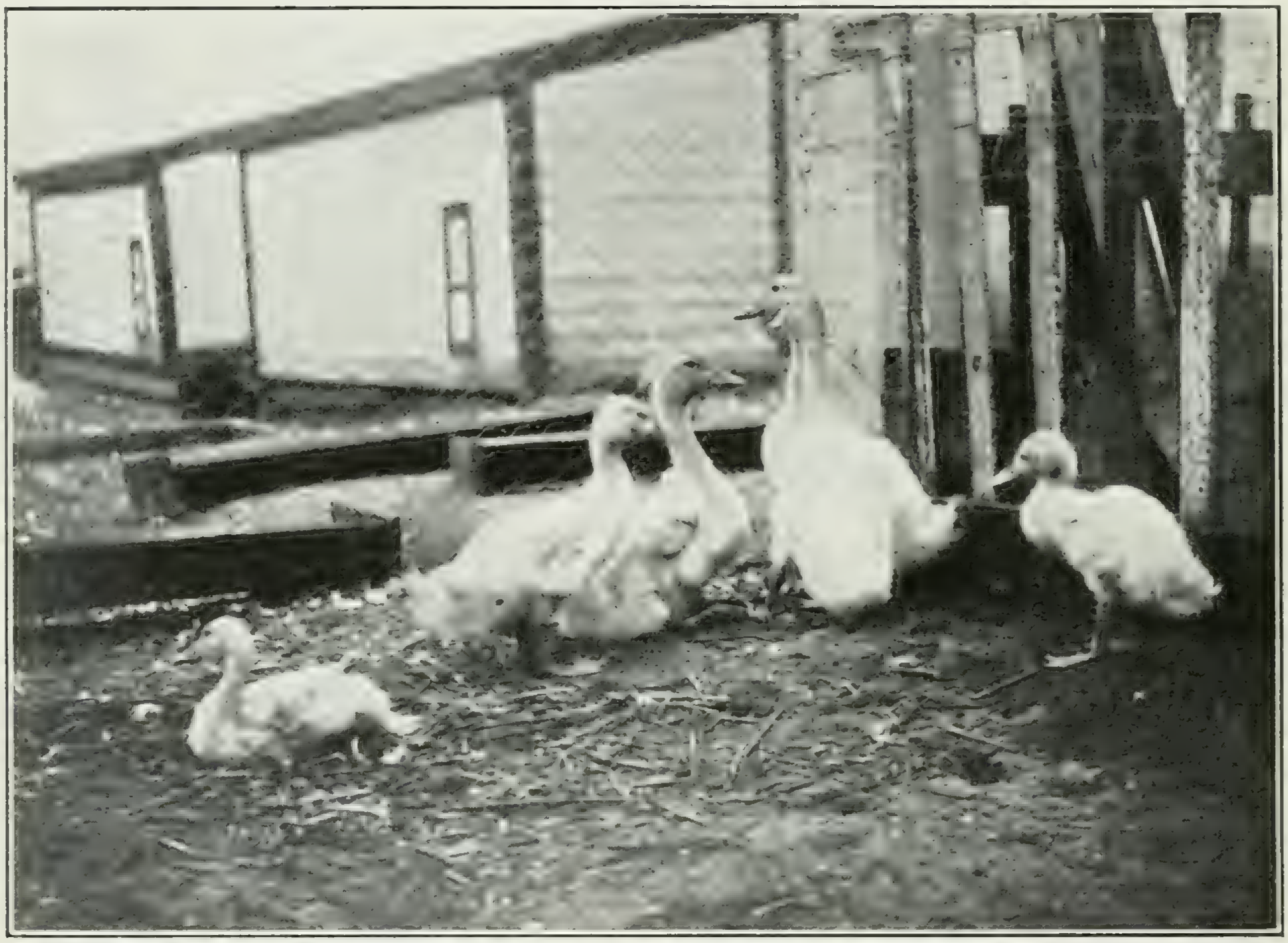
Birds from pen fed on best grade of baked wheat flour. Agassiz, B. C.



Birds from pen fed on raw rice shorts. Agassiz, B. C.



Birds from pen fed on boiled milled rice. Agassiz, B. C.



Ducklings from Rice Feeding Experiment.

Central group had been fed boiled whole rice for 27 days. They were then changed to a mixed grain ration.

Ducklings on extreme left and right were from the same hatch and are all that were left of the pen fed exclusively on boiled whole rice. Agassiz, B.C.

Summary of Hatching Records.

Name of Incubator.	Set.	Number of Eggs.	First Test.			Second Test.		Hatched.	Crippled	Per cent Fertile hatched.	Per cent total hatched.
			Infertile.	Blood rings.	Left in.	Dead germs.	Left in.				
Tamlin's	Feb. 9	160	40	5	115	10	105	40	5	37	28
"	Mar. 4	200	35	5	160	15	145	87	4	55	45
"	April 5	158	33	3	122	12	110	80	3	66	52
		518	108	13	397	37	360	207	12	53·3	41·6
Prairie State	Mar. 15	126	27	4	95	14	81	49	5	54	42
"	April 4	120	19	2	99	11	88	40	3	43	35
"	Mar. 3	120	22	.....	98	7	91	48	4	53	42
		366	68	6	292	32	260	137	12	50·0	39·6
Cypher Cap 144	Feb. 9	140	37	2	101	15	86	42	1	41	30
" "	Mar. 4	100	21	2	77	7	70	44	3	59	47
" "	Mar. 30	100	18	1	81	8	73	60	3	76	63
		340	76	5	259	30	229	146	7	58·6	46·6
Cypher Cap 244	Feb. 13	200	48	7	145	14	131	70	7	50	38
" "	April 4	230	46	7	177	12	165	90	4	51	40
		430	94	14	322	26	296	160	11	50·5	39·0
		1,654	346	38	1,270	125	1,145	650	42	585 — 53·2	462 — 42·0

THE REARING.

The season of 1915 was fairly favourable for the rearing of chicks. They were brooded a portion of the time by the Simplex brooding stove and a portion of the time by the Candee coal stove. The coal stove was first used about the middle of the brooding period. The change from the one to the other proved detrimental to the health of the chicks and some losses occurred at this time. There were 407 raised to maturity, they being chiefly March and April hatched. After culling closely, 75 S.C. White Leghorn and 100 Barred Rock pullets were selected for stock. The Leghorn pullets hatched March 3, commenced laying on July 27 and the Barred Rock pullets hatched on the same date commenced laying on October 6.

BREEDING STOCK.

In the fall of 1915 thirty of the best Barred Rock hens and twenty of the Leghorn hens were selected for breeding purposes the following spring. The remaining hens were crate fatted and sold to a local butcher for 12 cents per pound dry plucked. Breeding stock at the beginning of the winter of 1915-16 consisted of:—

100 Barred Rock pullets.
75 Leghorn pullets.
30 Barred Rock Yearlings hens.
36 S. C. W. Leghorn Yearlings hens.

EXPERIMENTS.

The experiments so far attempted have been of a general character and until another year has elapsed the stock will not be sufficiently uniform to allow of many comparative tests. A few experiments have been started but they are not sufficiently advanced to report on.

LETHBRIDGE.

EXPERIMENTAL STATION, LACOMBE, ALTA.

REPORT OF THE SUPERINTENDENT, G. H. HUTTON, B.S.A.

POULTRY.

The poultry department of this Station now (March 31, 1916) has to its credit 520 birds made up of 110 Barred Plymouth Rocks, 96 White Wyandottes, 52 Buff Orpingtons, 45 White Leghorns, 6 Toulouse Geese, 18 Pekin Ducks, 7 Bronze turkeys, and 286 March-hatched chicks. The Rhode Island Reds which were on hand early in 1915 have been sold and it is proposed to discontinue the breeding of Leghorns.

The improvements made during the year have included the erection of a frame turkey house 12 by 18 feet, a wire netting covering over two large pens to protect the chickens from crows and hawks, trap-nests in three pens of laying pullets and feed bins in all pens.

COST OF INCUBATION PER CAPACITY AND PER NUMBER OF CHICKS HATCHED.

During the incubation season of 1915 a record was kept of the fuel required to run the various incubators and of the eggs hatched from each one. The Candee hot-water incubator used here is a 1,200-egg capacity machine and required during the season 20 pounds of coal per day to operate it. This nut coal cost $8.50 per ton. The Cyphers machines each required one pint of oil per day valued at 23½ cents per gallon to operate them.

Seven hundred and thirty-four eggs were set in the Candee incubator in March, 1916, and these on being tested seven days after incubation commenced showed 79·5 per cent to be fertile. The winter egg laying records of these pens show that a very heavy egg production has been maintained throughout the winter and the fact that such a high fertility has been obtained so early in the season would tend to disprove to some extent at least the old theory that heavy winter egg production will mean low fertility of the eggs in spring. From these eggs 327 chickens were hatched, of which number 287 were put in the brooder.

A very accurate account has been kept of the nut coal burned to heat the Candee incubator for the first hatch in March, 1916, and has been found to be 23·6 pounds per day. This coal costs $8.50 per ton, and the following table shows the cost of the hatch. The cool weather of March may be responsible for the increased coal consumption and the fact that the machine was not completely filled also adds to the cost of chicks per 100.

TABLE showing Cost of Operations per 100 Chicks Hatched.

	Capacity.	No. of Eggs set.	No. of Eggs hatched.	Per cent hatched.	Cost of 100 capacity.	Cost per 100 chicks hatched.
						Cts.
Cyphers	140	727	331	45·5	44·0	93·0
Candee	1,200	2,336	1,033	44·3	16·46	57·5

COST OF FATTENING.

Thirty-seven birds selected as inferior quality stock were crate-fattened from October 26 to November 5, 1915. Somewhat better results might be expected from birds of good quality, but the fact that such gains were made on these fowls as shown in the subjoining table is an indication of the possibility in this directon.

Crate No. 1 contained four Buff Orpingtons and fifteen White Leghorns. The ration consisted of finely ground oats two parts, and shorts one part, mixed to the consistency of a thick batter with skimmed-milk.

Crate No. 2 contained eight Barred Rocks, and ten White Leghorns. A ration was fed of wheat two parts, and shorts one part, mixed with skimmed-milk to the consistency of a thick batter. The grain mixture in each case is valued at one cent per pound and skimmed-milk at twenty cents per 100 pounds.

The following table gives the results in detail:—

	Lot No. 1. Ration—Oats, 2 parts, Shorts, 1 part, Skimmed milk	Lot No. 2. Ration—Wheat, 2 parts Shorts, 1 part, Skimmed milk.
No. of birds in crate	19	18
Total weight of birds, Oct. 26 lb.	58·2	57·0
" " Nov. 5 "	83·0	81·0
Total gain "	24·8	24·0
Average gain per bird	1·30	1·33
Amount of grain fed	106·8	99·86
Amount of milk fed "	296·8	259·4
Cost of grain fed at 1 cent per lb	$ 1·06	0·99
Cost of milk fed, at 20 cents per cwt	$ 0·59	0·51
Total cost of feed	$ 1·66	1·51
Amount of grain fed per lb. gain lb.	4·30	4·16
Cost per pound of gain cts.	6·7	6·32

A total gain of 48·8 pounds was secured at a cost of $3.18. These birds all graded No. 1 and brought 16 cents per pound live weight, which leaves a profit on the gains made by these birds of 9·5 cents, the average cost per pound to fatten being 6·5 cents. These figures do not show the profit due to improving the quality of the meat already on the frame of the bird for which an increased price is obtained, and hence do not represent the true value of fattening the fowls.

LACOMBE.

SESSIONAL PAPER No. 16

TRAP-NESTING.

Trap-nests were constructed in three pens of the long frame house and records kept of the eggs laid by each hen for the winter months from December 1 to March 31. The following table giving the individual records of the hens in pen No. 3 clearly shows the superiority of some pullets over others as egg producers. It is quite evident that good results may be obtained by weeding out the non-producers in a flock of laying hens by trap nesting and is as important to the poultryman as is the weighing and testing of milk to the dairyman.

LAYING Record of Pen No. 3, White Wyandotte Pullets of Same Age.

No. of Pullet.	Egg Production for the Months of Dec., Jan., Feb., March.
1	58
2	82
3	51
4	28
5	73
6	45
7	71
8	13
9	4
10	45
11	22
12	38
13	52
14	7
15	74
16	14
17	41
18	3
19	76
21	1
22	13
24	57
25	50
26	36
27	22
29	72
30	82
32	43

A photograph is shown of the daily egg record of the pullets in pen No. 1, from which interesting conclusions may be drawn. It is claimed that farmers may select their best laying stock by trap nesting for the winter months when the hens are laying, and are thus able to choose a slack season of the year for this small amount of extra work. Pullet No. 24 laid an egg every other day for fifteen days and then stopped. Her total egg production for the four winter months was 43 eggs, while pullet No. 2, whose record shows two or three eggs in a cycle and one day missed between each cycle of egg laying, gave 77 eggs in four months. A hen such as this not only shows that she lays two or three eggs in a cycle, but also has the constitution to continue this production. Pullet No. 17 shows a variable number of eggs in a cycle, ranging from one to seven eggs. Her total production for four months was 55 eggs, and does not illustrate a particularly good type of hen. Pullets No. 12 and 7 laid 63 eggs respectively in four winter months. Their regular cycle of from two to four eggs is a sharp contrast against the record of No. 14, which lays one or two eggs and then misses several days before laying again. She produced but 17 eggs in four months.

It is of interest to note that the best laying pullets were medium size birds, while large, coarse birds were poor egg producers.

LACOMBE.

SHIPPING EGGS FOR SETTING VERSUS SHIPPING DAY-OLD CHICKS.

A test was made of shipping eggs for hatching as compared with shipping day-old chicks. The following is a table showing the results with the eggs and chicks received at Lacombe Station. All shipments were made by express.

SHIPPING Eggs for Hatching and Day-old Chicks.

EGGS.

Received from	Breed.	No. of Eggs received	Total hatched.	Per cent Fertile.	Per cent Fertile hatched.	Per cent total Eggs hatched.	Alive at two weeks of age.	Alive at one month of age.	Average weight at one month
Brandon. .	White Wyandotte	98	23	59	47·4	28·5	11	11	0·36 lb
Agassiz.....	White Leghorn	99	86	93	92·4	86·8	70	60	0·25 "

DAY-OLD CHICKS.

Received from	Breed.	Number shipped.	Alive on arrival.	Alive in two weeks.	Alive in one month.	Average weight at six weeks.
Brandon.....	White Wyandottes..	50	39	1	1	0·34 lb.
Agassiz.....	White Leghorns.....	75	75	70	64	0·37 "

COST OF PRODUCING EGGS DURING THE WINTER MONTHS.

The following table gives the cost of producing eggs from pullets in four pens of the long frame house. The birds were fed wheat, oats and barley, in varying proportions, with a little beef scrap mixed, and had free access to grit and oyster shell at all times. These figures are given for the months of December, January, February and March.

The Barred Rock pullets in pen No. 2 are considerably younger than those in the other pens and are, therefore, at a disadvantage when compared with the other breeds. The cost to produce eggs from all breeds, both pullets and hens being included, is 16·2 cents per dozen and would represent the average cost for any farm flock where both young and old stock are used for laying purposes.

TABLE showing the Cost of Eggs per dozen for Winter Months.

Pen No.	Breed.	No. of Birds.	Value of Feed for the period.	No. of Eggs laid	Cost per dozen.
			$ cts.		cts.
1.....	White Wyandotte.....	32	13 42	1,436	11·2
2.....	Barred Rocks.....	31	14 23	1,207	14·1
3.....	White Wyandotte.....	28	12 10	1,258	11·5
4.....	Buff Orpingtons.....	31	13 55	1,386	11·7
Total.....	.....	122	53 30	5,287	12·1
All breeds.....	.....	298	119 70	8,888	16·2

LACOMBE.

EXPERIMENTAL STATION, INVERMERE, B.C.

REPORT OF THE SUPERINTENDENT, G. E. PARHAM.

POULTRY.

Though the spring was early the months of May and June were cold, with high winds, and the early growth of the chicks was somewhat backward in consequence.

LOCATION OF THE PLANT.

The new location on the north slope of the Toby Gorge proved most satisfactory during the summer months, but the lack of sunshine during the winter months prevents it from being an ideal location all the year round.

This land is practically of no value for other farm purposes, in that it is too undulating and non-irrigable, and as there is so much land of this type in the dry belt of British Columbia, its use for poultry raising should prove of particular value.

The water supply and the fencing to keep out coyotes are the chief factors to be considered in making use of such land for this branch of farming. The five-foot poultry fence used seems to be proof against the coyotes.

BUILDINGS.

The new administration building with root cellar and incubator room in the basement and a large storeroom above now used as a dwelling for the poultryman, has been invaluable during the whole year. During the summer water was laid on from the main water works. The houses were moved to their new quarters in the spring and suitable pens made for breeding purposes.

A new brooder house 12 feet by 10 feet for Candee heater has been erected, and is now ready for the coming season's work.

INCUBATORS AND BROODERS.

The Cyphers 120-egg machine again gave excellent results. The Tamlin 200-egg machine used for the first time this spring proved anything but satisfactory. A further test of this machine will be made in the coming season.

A Prairie State No. 2 incubator is being installed to test with the other machines. Brett's Cabinet adaptable hovers and Cypher's adaptable and portable hovers were used throughout the past season, and gave good results.

BREEDING STOCK.

Two pens of White Leghorns, one of Barred Rocks, and one of Light Sussex were mated for the breeding season. The eggs were of a high average fertility, but the chickens from the Sussex were weakly, and few came to maturity. The chickens from the Rocks and Leghorns were healthy. Very few deaths occurred except from

the depredations of hawks. Constant care has been needed to keep down the external parasites. Head ticks have been particularly troublesome, but by the application of coal oil, lard, and water in the proportion of 1, 2, 3, this parasite has been controlled.

FEEDS AND FEEDING.

Grit used for the past three years has been obtained from the siftings of a copper mine. It is passed through three sieves for grading for turkeys, hens, and chickens, and has proved satisfactory and economical.

Charcoal and oyster shell are supplied *ad lib.* to all birds. The increased amount of oyster shell used when the birds are laying is very marked, indicating the extra amount required for shell formation during the laying season.

The problem of early green feed in this climate has been satisfactorily solved by sprouting oats in the hot-bed. The oats are first soaked for a few hours in water and then placed on sacking in a bottomless box. This method has been found the most practical as the sacking can be rolled up and is easily carried to the birds. The oats take about eight days to produce the required growth, so that in order to have a supply each day eight boxes are required. Rape is seeded each year in July to remain over winter, which supplies an early spring feed. Small patches of this growth have been hastened by covering with glass or cotton. Green clover is used extensively during the summer months and is followed by cabbage and beets.

Experiments are being made with two pens of birds, viz., Barred Rocks and White Leghorns, to ascertain the following information for the year November, 1915, to October, 1916: Number eggs laid, average price, average weight per dozen, total value of eggs, value of feed consumed, loss or gain per pen, cost of one dozen eggs.

TURKEYS.

The same three hens and bronze gobbler that were bred last year were used for breeding again this season; also a pen of the last year's pullets were mated to an unrelated two-year-old gobbler.

The stock birds are kept in yards throughout the year and have no shelter other than the fir trees.

Hatching commenced on the 24th of May, the first eggs were placed under hens, the latter ones under turkeys.

Seventy birds survived out of a total of ninety-two hatched. The losses were chiefly from hawks, and from crop binding. No evidence of black head was seen. Both hens and turkeys were freely dusted with pyrethrum powder during the setting period.

The young turkeys had the free range of about eighty acres of side hill and did well until September, when insect life became scarce and they ceased to range. At this time they were given additional food and by a slight alteration in their run they soon began to thrive.

In August, sixty-five birds were set apart for estimating the quantity and cost of food consumed. On November 8, twenty-three of these birds were selected for stock purposes, and the experiment was continued with the forty-two remaining.

The cost and quantity of food consumed by 65 birds from August 1 to November 8—

134	lb. wheat	$ 2 68
266	" oats	5 98
134	" cracked corn	3 21
369	" bran	5 16
551	" corn meal	12 39
185	" shorts	2 77
97	" oyster shell	1 55
2,500	" green clover	7 50
	Total	$41 24

Cost and quantity consumed by 42 birds, November 8 to December 22—

150	lb. wheat	$ 3 00
305	" corn meal	6 86
305	" shorts	4 57
305	" barley chop	4 72
41	" beef scrap	1 84
20	" charcoal	25
600	" cabbage	1 80
	Total	$23 04

Total cost per bird, August 1 to December 22—

Cost per bird from	August 1 to November 8	Cents 63
" "	November 8 to December 22	" 55
" "	August 1 to December 22	$ 1 19

It will be noticed that a more concentrated diet was given during the latter period in order to fatten the birds for the Christmas market.

The 43 birds were weighed on November 10; total weight, 321 pounds, an average of 7·6 pounds per bird.

On December 7 these birds weighed 420 pounds, an average of 10 pounds.

On December 18 the same birds averaged 11 pounds each.

The birds realized 20 cents per pound live weight.

Cost of feeds in 100-pound lots at times of experiment—

Wheat	$2 00
Oats	1 50
Cracked corn	2 40
Bran	1 40
Corn meal	2 25
Shorts	1 50
Shell	1 60
Barley chop	1 55
Beef scrap	4 50
Charcoal	1 10

Cabbage and Clover grown on the farm estimated at 30 cents—Statement—

42 turkeys, 11 pounds, total	lb.	462
462 pounds at 20 cents per pound	$	92 40
Cost from August 1, 119 each	"	49 98
Balance	"	42 42

This does not include any expense prior to August 1.

INVERMERE.

EXPERIMENTAL FARM, AGASSIZ, B.C.

REPORT OF THE SUPERINTENDENT, P. H. MOORE, B.S.A.

POULTRY.

Stock.—The number of birds in the flock has been slightly increased during the year. The flock is now about as large as can be handled by one man when reliable records of all operations are of more importance than commercial work.

The stock at mid-winter consisted of 254 Barred Plymouth Rocks, 239 S.C. White Leghorns, 33 White Pekin Ducks, and about 50 squab-producing pigeons, making a total of over 500 birds, not including pigeons. Over 1,200 chickens were hatched in the spring of 1915, and this permitted of reasonably good culling in the autumn. The chicks were hatched in small, oil burning incubators. All the progeny of the trapnested birds of 1914 were trapnested this season, which number amounted to one-half of the entire flock.

Mammoth Incubator.—This season a 1,200 egg, coal burning Candee incubator was installed, and besides the needs of the plant here, a large amount of custom hatching was done for poultry raisers in the district, and a small number of day-old chicks were sold.

New Buildings.—The work has been greatly aided by the erection of an administration building. This building has room for the incubators, an egg room, and a fuel room in the basement, a general work room, an office, a record room, and a bedroom on the first floor; a feed and storage room in the attic. A brooder house, 16 feet by 24 feet, or large enough to accommodate two Candee coal burning brooders, was also built. This building is of the shed roof, open front type, and has given excellent satisfaction.

Management.—The work has been most capably handled by Mr. Vernon Kuhn, who has had charge of all poultry operations on this Farm for the past three years.

Early and Late Rock Pullets.—In the past a comparison has been made between early and late hatched pullets. This year there was only a difference of one month between the first hatch and the last hatch. The early Barred Plymouth Rock pullets were put into laying pens in September, and they produced eggs in October for 23·5 cents per dozen when the price was 45 cents per dozen. Each bird made 13·75 cents profit for the month, and they have that advantage over the birds that did not begin to lay profitably until the 1st of November. The following record of their performance is for the period from October 1 to April 30.

EARLY versus Late B. R. Pullets.

		Early.	Late.
No. of birds in pen		24	71
No. of days on trial		213	213
Amo unt of grain fed	Pounds	1,384	3,672
Amount of green food fed	Pounds	1,050	2,100
Amount of skimmed milk fed	Pounds	770	1,575
Total number of eggs laid		1,899	4,962
Weight of eggs	Ounces	3,786·92	9,589·06
Weight per dozen eggs	Ounces	23·93	23·19
Number of days per hen per dozen eggs		32·30	36·57
Pounds of grain per dozen eggs		8·74	8·88
Pounds of grain per one pound eggs		5·84	6·12
Pounds of green food per dozen eggs		6 53	5·07
Pounds of skimmed milk per dozen eggs		4 86	3·89
Cost to produce one dozen eggs	Cents	15·37	15·64
Cost to produce one pound eggs	Cents	10·45	10·60
Per centage of fertile eggs		86·24	83
Per centage of fertile eggs hatched		63·8	63·85
Per centage of total eggs hatched		55·02	53

Early and late S.C.W. Leghorn Pullets.—A trial was made with Single Comb White Leghorn pullets on the same basis as with the Barred Plymouth Rocks, but as the late hatched White Leghorns did not lay until the 1st of November their reported period is 31 days shorter than their competitors.

Their performance from October and November 1 to April 30, is given as follows:—

EARLY versus Late Single Comb White Leghorns.

	Early.	Late.
No. of birds in pen	42	60
No. of days on trial	213	182
Amount of grain fed ..... Pounds	1,623	1,846
Amount of green food fed ..... Pounds	1,050	1,440
Amount of skimmed milk fed ..... Pounds	770	600
Total number of eggs laid	2,436	2,448
Weight of eggs ..... Ounces	4,809·07	4,726·68
Weight per dozen eggs ..... Ounces	23·69	23·17
Number of days per hen per dozen eggs	44·06	53·52
Pounds of grain per dozen eggs	8	9·04
Pounds of grain per one pound eggs	5·43	6·24
Pounds of green food per dozen eggs	3·74	7·05
Pounds of skimmed milk per dozen eggs	5·17	2·94
Cost to produce one dozen eggs ..... Cents	14·35	16·76
Cost to produce one pound eggs ..... Cents	9·69	11·57
Percentage of fertile eggs	92·68	Not used.
Percentage of fertile eggs hatched	50·21	for breeding.
Percentage of total eggs hatched	46·54	.....

Rock pullets and hens.—The following table was made for the comparison of Barred Rock Pullets of the early sort with one year old hens of the same breed.

PULLETS versus one-year-old Hens, Barred Rocks.

	Pullets.	One year old Hens.
No. of birds in pen	24	39
No. of days on trial	213	182
Amount of grain fed ..... Pounds	1,384	1,689
Amount of green food fed ..... Pounds	1,050	1,500
Amount of skimmed milk fed ..... Pounds	770	758
Total number of eggs laid	1,899	1,871
Weight of eggs ..... Ounces	3,786 92	3,897 75
Weight per one dozen eggs ..... Ounces	23·93	25
Number of days per hen per dozen eggs	32·30	45·52
Pounds of grain per one dozen eggs	8·74	10·83
Pounds of grain per one pound of eggs	5·84	6·93
Pounds of green food per one dozen eggs	6·53	9·42
Pounds of skimmed milk per one dozen eggs	4 86	4·86
Cost to produce one dozen eggs ..... Cents	15·64	18·73
Cost to produce one pound of eggs ..... Cents	10·45	11·98
Percentage of fertile eggs	86·24	92·63
Percentage of fertile eggs hatched	63·80	51·13
Percentage of total eggs hatched	55·02	47·36

The yearling hens were kept for breeding purposes and it will be noted that they laid eggs which averaged over one ounce per dozen more in weight but the pullets produced a pound of eggs cheaper than the hens did. Although the hens gave a higher

percentage of fertility than the pullets the percentage of fertile eggs and the percentage of total eggs to hatch, was greater with the pullets than with the hens. This hatching record was not the case with the White Leghorns.

Single Comb White Leghorn Pullets and Hens.—Single Comb White Leghorn pullets and hens were also compared with the following results.

PULLETS versus One-year-old Hens, White Leghorns.

		Pullets.	One year old Hens.
No. of birds in pen		42	20
No. of days on trial		213	182
Amount of grain fed	Pounds	1,623	736
Amount of green food fed	Pounds	1,050	758
Amount of skimmed milk fed	Pounds	770	.....
Total number of eggs laid		2,436	864
Weight of eggs	Ounces	4,809·07	2,319·76
Weight per dozen eggs	Ounces	23·69	25·83
Number of days per hen per dozen eggs		44·06	50·55
Pounds of grain per one dozen eggs		8	10·22
Pounds of grain per one pound eggs		5·43	6·33
Pounds of green food per one dozen eggs		3·74	10·52
Pounds of skimmed milk per one dozen eggs		5·17	.....
Cost to produce one dozen eggs	Cents	14·35	16·73
Cost to produce one pound eggs	Cents	9·69	10·35
Percentage of fertile eggs		92·68	94·69
Percentage of fertile eggs hatched		50·21	62·00
Percentage of total eggs hatched		46·54	58·71

It will be noticed here that the hens had more advantage over the pullets with respect to the weight of eggs than was observed with the Barred Plymouth Rocks. The hatching results of the Leghorn hen eggs were superior to those of the pullets. Last year pullets gave better results than two-year-old-hens, but the performance of the yearling hens is the best yet obtained with White Leghorns.

Decrease in Fertility after removal of Males.—A test was made this year to procure figures relative to the length of time that eggs would remain fertile after the removal of the male birds from the breeding pens. A number of eggs were taken from the breeding pens and daily placed in the incubator. The test was started three days after the removal of the male. The following results were obtained:

TABLE showing Decrease of Fertility after Removal of Male.

Day.....	3rd	4th.	5th.	6th.	7th.	8th.	9th.	10th.	11th.	12th.	13th.	14th.	15th.	16th.	17th.	18th.
Percentage fertile eggs.	100	100	100	83·3	100	33·3	66·6	50	50	33·3	16·6	16·6	16·6	Nil.	Nil.	Nil.

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Experimental Feeding.—Last season some work was reported relative to certain diets and their effect on mature birds. Some work of the same nature was done this year with young growing stock and the results are very similar. The trial lasted sixty-seven days, and the weather was good throughout. The following chart will illustrate some of the results obtained:—

TABLE showing summary of results from feeding experiment.

—	Mixed grains raw.	Unmilled rice shorts.	Milled rice boiled.	Milled rice and appetizer. boiled.	Rice shorts fed as mash.	Best grade wheat flour baked.
Number of birds per pen at start.....	8	8	8	8	8	8
Number of birds per pen at finish.....	8	8	0	0	5	4
Total weight at beginning.....Pounds	10·9	12·4	11·5	12	13·1	12
Total weight at finish..... "	21·1	11·9	0	0	13·2	9·4
Gross gain in weight..... "	10·2	— 0·5	—11·5	—12	0·1	— 2·6
Amount food consumed..... "	88·	37·	32·5	30·75	79	59

Notes on Feeding Experiment.—The birds were comfortably housed and well cared for. They were given all the food they would consume and always had a good water and grit supply. It will be noted that the mixed grain lot ate the most feed and made decidedly the most gains and remained healthy under the conditions. In the lot fed on unmilled boiled rice two of the birds died and all turned anaemic before the 67 days' feeding was finished. Bones from all the birds were soft, but those that died were very soft and elastic. The birds getting milled rice all died before the end of the trial. They all got weak in the legs, the bones turned soft, and all died before they became very poor in flesh. They were all very white and anaemic. Another lot fed on the same kind of rice, but with an addition of sugar and salt, ate very greedily for a week or two, then became ill before their mates who did not eat so much. All of the birds that ate heartily at the beginning died before their mates that did not have such good appetites at first.

The birds receiving rice all had a very green or bile-stained appearance in the gizzard, and as a rule the droppings were watery. The birds fed a very high grade of rice shorts only showed symptoms of trouble after feeding for several weeks, but when they did start to go off they developed exactly the same symptoms as the rice-fed birds. The pen of birds that received the best grade of white flour, baked into cakes without yeast, ate very heartily for a time, but they became weak and neurotic at about the same time the rice-fed one did. This food seemed just about as deficient as the rice in material suitable for the building up of the growing frame.

Ducks.—The flock of White Pekin ducks was increased to 30 this year. For a short time during the autumn the ducks were allowed to roam on the stubble fields, and this method of handling was found quite profitable because they gathered practically all their feed. Later they were put into the poultry yards, where range was impossible, and although fed on a comparatively cheap ration, consisting principally of bran and ground oats, they were expensive feeders. From July, 1915, to April 30, 1916, a period of 10 months, they cost $2.20 per duck. They began to lay in February, and up to April 30 had laid 35·4 eggs per duck. By selling this output for hatching at $8 per 100 eggs, each duck made 63 cents over the cost of feed. This amount is not enough to pay interest and expenses and unless there is plenty of range for the breeders there does not appear to be much margin. This flock had to be kept in confinement the greater part of the time, and when fed for a year for only a short season

of breeding and egg selling the profit was small. Unless the eggs produced in May and June could also be sold for hatching purposes, one should have cheap range to run the ducks on during the greater part of the year.

Kept in close confinement with only a small tank of water the fertility and hatching of the eggs was not good. From the eggs hatched in five different machines the following results were obtained:—

Per cent eggs fertile	85·38
" " fertile eggs hatched	44·91
" " total eggs hatched	38·34

Experiment on Feeding Ducklings.—In connection with the testing of feeds, a small experiment was made with a number of ducklings on a rice ration. However valuable rice may be for fattening ducks and for producing white flesh, it does not contain the elements necessary for the growth of young animals or birds. The results obtained with both pigs and ducks are identical.

The following notes made on the experiment illustrate the result obtained with the ducklings:—

Boiled whole rice as duckling food.

1st Period—1 to 14 days.

Original weight of 22-day old ducklings	lb.	2·25
Average weight per duckling	"	0·10
First 14 days (June 22-July 6) fed, by weight, 3 parts bran, 3 parts corn meal, 1 part wheat shorts, 1 beef scrap. A dash of sand and charcoal and the lot moistened with water. Water given to drink.		
One bird killed by accident.		
Second weight 21 ducklings, 14 days old	lb.	8·85
Average weight per ducking	"	0·42
Total gain	"	6·6
Total mash eaten	"	17·0
Food consumed per pound gain	"	2·57

2nd Period—14 to 41 days.

Ducklings all fed boiled whole rice for 27 days (July 6-August 2). Rice well boiled and crumbly, water given to drink. Birds ate well for first 7 days then went off. Later they got weak in the legs, all looked anaemic. Two ducklings withered up and died.		
Third weight, 19 ducklings	lb.	10·56
Average weight per duckling	"	0·55
Total gain	"	1·71
Total rice consumed	"	50·0
Food consumed per pound gain	"	29·2

3rd Period—41 to 83 days.

After this date (August 2) the lot was divided. Pen 1 (5 birds) was left on rice. Pen 2 (14 birds) put on the original mash. Pen 3 (4 birds, 14 days old) was also put on the original food.

These pens were fed until September 14, 1915, 42 days.

Pen 1. The birds in pen 1 (rice fed) all died except one, and it was just alive. It weighed 0·7 pound.

Pen 2. (Birds changed from rice to mixed grains).

Weight at change 14 ducklings	lb.	9·5
" end of period, 14 ducklings (42 days)	"	70·0
Average weight per duckling	"	5·0
Total gain	"	60·5
" grain consumed	"	285·0
Food consumed per pound gain	"	4·7

Pen 3. Young ducklings fed mash.

Original weight (14 days old) 4 birds	"	3·0
Weight at finish (42 days)	"	23·0
Average weight per duckling	"	5·75
Total gain	"	20·0
" grain consumed	"	81·8
Food consumed per pound gain	"	4·08

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It will be noted that the ducklings made four times their original weight in the first 14 days when being prepared for the experiment. While being fed on rice for 27 days they made only 0·13 pound gain and consumed 29·2 pounds of rice for every pound of gain. On continuing this food for 42 days all ducklings so fed died, although they consumed a large quantity of boiled rice. The ducklings changed from rice to a mixed grain ration gained in weight and consumed almost the same feed for pound gain as the young ducklings that had not received any rice but were kept growing from the start.

PIGEONS.

The small flock of White Homer pigeons has increased to the full capacity of the small house erected last year. The original stock proved excellent workers and have produced well during the year. The house proved too small for the flock during the long, cold winter, when the birds could not stay outside a great deal. Seven pairs of squabs were lost in the nests by crowding during this extreme cold. A larger house is being fitted at present.

It was rather difficult to get the exact figures upon the feed consumed, because as well as the pigeons some two hundred English sparrows had to be fed all winter. The wire on the fly was just open enough in the mesh to admit the sparrows and as soon as they became aware of this they lived in luxury the rest of the season.

The feed used consisted of a mixture of wheat, cracked peas, cracked corn, and barley, and it appeared to be sufficient for the growth of the young.

The results obtained this past season are as follows:—

Original stock, 5 pairs			10 birds.
Number of squabs hatched in year			59 "
Died in nests in winter	14	birds.	
Killed by accident or rats	2	"	
Killed for market	3	"	
			19 "
Total raised to maturity			40 "
Amount of food consumed in 1 year			lb. 1,037
Cost of food for 1 year			$ 20 74
Cost per bird raised or maintained			cts. 37·7

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DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE
DOMINION EXPERIMENTAL FARMS

REPORT

FROM

THE TOBACCO DIVISION

For the Year Ending March 31, 1916

PREPARED BY

The Dominion Tobacco Husbandman. - - - - - - - - - - F. Charlan.
Manager, Tobacco Station, St. Jacques, Que. - - - - - - - O. Chevalier, I.N.A.
Manager, Tobacco Station, Farnham, Que. - - - - - - - - O. Chevalier, I.N.A.
Manager, Tobacco Station, Harrow, Ont. - - - - - - - - - G. C. Routt, B.S.A., M.S.

REPORT FROM THE TOBACCO DIVISION

OTTAWA, March 31, 1916.

J. H. GRISDALE, Esq., B. Agr.,
Director Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith the report of the Tobacco Division for the year 1915-16.

Towards the end of 1915, the staff of the Tobacco Division was reorganized and considerably increased, in order to meet the requirements of the English-speaking districts.

Annexed to the report of the work done at Ottawa is a summary of the work at the various Tobacco Experimental Stations.

I have the honour to be, sir,
Your obedient servant,

F. CHARLAN,
Chief, Tobacco Division

THE TOBACCO DIVISION.

Without modifying to any appreciable extent, in its broad lines, the policy of this Division, it is necessary, as the tobacco industry develops in Canada, that our agents should specialize in the study of various problems, the practical importance of which is becoming increasingly evident. With this purpose in view, important additions were made to the staff of the Tobacco Division at the end of the year 1915-16. A soil expert and a pathologist were appointed. The first will make a special survey of tobacco soils of Canada and a study of the problems connected with the maintenance of their fertility; the second will take up the study of the diseases of tobacco and direct the work of selection and plant breeding, inaugurated during the last few years.

A survey of tobacco soils.—Experiments have shown that certain soils are better suited than others for the growing of certain strains of tobacco. Of course, any soil, no matter how ill suited, may give a crop, but often the market value of the products is practically nil or at least very low, because they have not the desired qualities. Growers must therefore endeavour to select a suitable variety, otherwise they had better give up the growing of tobacco which cannot be paying under such conditions.

On the other hand, in sections of Canada where the growing of tobacco has made considerable progress during the last few years, it is necessary that growers should know definitely the types that are the most suitable for the various kinds of soils that are to be found on their farms.

This necessitates a classification of tobacco soils, according to the nature of the crops that may be obtained on such soils. This classification is now under way; it is based on the practical results already obtained, especially in Ontario, with the flue cured tobaccos and the Burleys. The soils that have yielded the best crops of each type several years in succession will be taken as "standards" for Canada, or even for the province.

Later on, whenever a soil is found that approximates one of these standard types, it will be possible to inform the farmer as to the variety of tobacco that should be grown on this particular soil.

The survey of tobacco soils in Canada has been placed in charge of Mr. H. A. Freeman, who entered upon his duties in the fall of 1915. His laboratory was installed at Ottawa during the winter and a considerable amount of work has already been done.

Pathology and plant breeding.—Canadian tobacco growers, especially in Ontario, have noted, during the last few years, that it is difficult to obtain a normal crop of White Burley on soils that have grown tobacco for several years in succession.

This is due to the presence of a disease that has caused considerable damage in Ontario as well as in a few tobacco centres of the United States.

Fortunately, in Canada, this disease seems to have been limited so far to southern Ontario. It has not been observed in the Quebec growing centres, whilst in the United States it has already attacked the Kentucky Burleys, the binder tobacco of Wisconsin and even that of Connecticut.

The appointment of a pathologist, whose duty will be to deal specially with tobacco diseases in Canada, fills an important need. Up to the present considerable work has been done with a view to check such diseases in the United States and Canada. However, owing to the immense area of territory involved, the means of control have not been adequate.

Mr. G. C. Routt will take charge of the pathological laboratory of the Tobacco Division on May 1, 1916. This laboratory has been erected at Ottawa.

Before being appointed as pathologist, Mr. Routt was temporarily in charge of the experimental station of Harrow, during the season 1915-16, taking the place of Mr. W. A. Barnet, who resigned on April 1, 1915.

Appointment of Manager.—Mr. D. D. Digges was appointed manager of the Harrow Experimental Station from December 1, 1915, in place of Mr. G. C. Routt, appointed pathologist.

The Tobacco Division thus has two agents in Ontario, Messrs. Freeman and Digges, who were brought up in the bright tobacco districts of Virginia and South Carolina, and who have been thoroughly prepared for their new duties by a university course. With their help, it is hoped that the problems connected not only with the production of White Burley in Canada but also with the production of flue cured tobacco (a very promising industry), may be solved.

The season.—The season of 1915 was one of the most unfavourable that has been experienced for many years in Canada. It may be said to have been absolutely adverse to the growing of tobacco. There was a lack of heat throughout the summer and such an abundance of rain that in the majority of cases the tobacco plantations, even during the period of growth, could not get sufficiently dry at any time, which explains the losses suffered by Ontario and Quebec growers. Such conditions favour the propagation of numerous diseases, as well on the beds as in the field, and the year 1915 was no exception to this rule.

However, there was a large increase in the production of bright tobacco in Ontario, and, generally speaking, an improvement in the quality. The explanation of this result may be found in the fact that the soils were more judiciously selected than usual this year. An important growing centre, largely formed of new growers, has been established on the shores of Lake Ontario, where are to be found yellow sands, with a fine texture, which, heretofore, were not used for Burley on account of their lack of fertility, but it is on these comparatively poor soils that bright tobaccos give the best results.

As regards the province of Quebec, most of the crop of 1915 was washed. The harvesting was done under difficulties and the cured products were not so elastic nor so aromatic as usual.

Experiment with fertilizers.—This experiment, which has been carried on for several years, suffered this year from the unfavourable conditions of the season. The results obtained in 1915 were not nearly as conclusive as the preceding ones. Taken as a whole, however, they confirm observations made in the past. In order to secure a good crop of tobacco in Canada, as well in Ontario as in Quebec, it is necessary to apply a large quantity of barnyard manure, supplemented by an application of chemical fertilizers. In each case, the plots on which chemical fertilizers were applied gave larger yields than those that had received only barnyard manure.

Since in each case, the quantity of manure applied seemed to be sufficient to fertilize the tobacco plots and satisfy all the requirements of the crop, the only explanation that can be given of the beneficial influence of chemical fertilizers is that they supplied immediately available plant food, which hastened the growth of plants. The tobacco plant comes to full size in a very short period of time; it is necessary, and even indispensable, therefore, to apply a large quantity of manure. This manure constitutes the foundation without which it is impossible to secure a crop, even with the use of chemical fertilizers, but in Canada at least, chemical fertilizers have the greatest influence on the yield and perhaps also on the quality.

Under Canadian conditions, it seems that when a good rotation is followed (tobacco, cereals, clover), tobacco is specially benefited by the application of chemical fertilizers, and other crops by the application of barnyard manure. If tobacco were to be grown year after year, one or the other of these fertilizers would be lost to a great extent. Barnyard manure alone very seldom gives a maximum yield and experiments have shown that, so far as the province of Quebec is concerned, chemical fertilizers, used alone, are insufficient to insure an average crop, except in special cases. It should be stated, however, that although chemical fertilizers are indispensable if one wishes to secure a paying crop, as may be seen in the results obtained in 1915 on our Farnham Experimental Station, it is rather dangerous to apply them in too large quantities.

Harvesting.—The adoption of the methods reducing to a minimum the length of time during which the crop remains in contact with the soil after being cut has again been urged this year in Ontario and Quebec. It cannot be doubted that the use of movable scaffolds in the field shortens considerably the time required for wilting, at least in the province of Quebec. The results have not been quite so decisive in Ontario.

Curing.—The use of charcoal heaters, especially in Ontario, instead of depending only upon the ventilators to control the degree of moisture in the curing house, has enabled us to secure a larger proportion of bright coloured tobacco. It is difficult to draw definite conclusions from an experiment which has been carried on during such an unfavourable season; and it is not certain, as yet, that the margin between the price paid for Burleys cured by the usual method and for those cured by means of charcoal heaters, is sufficient to justify the expenditure. This question will be solved only when a sufficient quantity of tobacco, cured by each of these two methods, has been obtained to enable the manufacturers to judge their respective merits.

Notes on some varieties.—Owing to the unfavourable conditions of the season of 1915, it was not possible to make a good comparison of the different varieties of White Burley tried at Harrow. The ripening took place at a rather late date in the season and, generally speaking, the symptoms of ripening were not so well marked as usual.

As regards the Farnham Experimental Station, it is not easy to draw conclusions from the results given by the different varieties of binder tobacco grown on this station. However, the Big Ohio x Sumatra was able to stand the unfavourable conditions of the season while the Comstock Spanish, Yamaska and Havana Seed Leaf suffered considerably. The General Grant grown at Farnham in 1915 was of very poor

quality. These tobaccos ripened and cured poorly. The Farnham Warne gave a medium crop, both as regards quantity and quality. The Aurora is the only one that yielded a normal crop, really profitable in quantity and quality. If this tobacco can be accepted as filler by Canadian manufacturers, experience has shown conclusively that it can be grown easily and at a paying price in the province of Quebec.

At the Ottawa Experimental Farm, on the test plot, the Marylands have been rather a disappointment. The selection No. 1045, which had given a fine crop of bright yellow tobacco in 1914, made an excellent start during the month of June, but took a dark hue during the latter part of the period of growth and did not ripen as well as it had done in 1914. The product was very much darker than the crop of 1914, which had been in great demand.

Imported Marylands from the counties of St. Mary, Charles, and Prince George, gave us fine crops, at least so far as the yield in weight is concerned, but the colour was not as good as might have been desired.

It is obvious that no satisfactory products, with the required colour and texture, can be expected from these varieties in an unfavourable year. However, seasons like that of 1915 are rare, and we are still confident that Marylands may give very good results in all parts of Canada where the season remains favourable until the 15th or 20th of September, and wherever light soils with a fine texture and not too dark colour are found.

Belgian tobacco.—This tobacco, the selection of which was started in 1914, is practically fixed now. This is, probably, an "Obourg," of a good yield in weight, early and easy to cure. The growing of this variety will certainly become general in the province of Quebec. According to the treatment which it receives in the warehouses, it may yield cigar fillers or fragrant pipe tobacco.

Pennsylvania Broad Leaf.—This tobacco had been tried at the request of some Montreal manufacturers, but it did not seem to be adapted either to the soil on which it was grown or to the abnormal conditions of the season of 1915. It will be tried again.

Aurora.—The selection of this variety was resumed in the season 1915. Three types have been distinguished, especially by the habit of the leaves when the plant ripens.

Espada.—Among exotic varieties this tobacco, which was imported from the Philippine Islands, seems to be promising. It was probably a little overripe when harvested, and this fact, together with the conditions of the season, resulted in the production of a somewhat dry leaf. It yields a filler with a light taste and a pleasant aroma. The objection is the exaggerated height of the stalk, which often extends to eight or nine feet. Farmers who want to grow this tobacco will have to change the inside fitting of their curing houses.

Other varieties.—A summary of the observations made on other varieties of tobacco tried at Ottawa, in 1915, is given in that part of the report dealing specially with the work at the Central Experimental Farm. In a general way, the main object in growing the latter varieties is to get selected seed in order to continue, in due course, the study of these varieties or simply obtain a supply of seed for distribution.

Big Ohio x Sumatra—Yamaska.—As regards these two varieties, considerable progress seems to have been made in 1915, but a good part of this progress is doubtless due to previous selections.

For the first time during the winter 1915-16, really good farmers have been found who have agreed to try the Big Ohio x Sumatra on a large scale. It cannot be denied that all things being equal (yield in weight, taste of the products, etc.), the Big Ohio x Sumatra yields better binders than the Comstock, as the leaf is thinner and covers more cigars for a given weight of tobacco. As regards the Yamaska, although this

tobacco suffered somewhat from the unfavourable conditions of the season 1915, it was found that it gave a light filler, with an excellent aroma. This tobacco, which had been specially selected with a view to the production of a thin binder, may, if this binder is not satisfactory, be used as filler. Thus, all possible contingencies have been foreseen, and if the observations made in 1915 are confirmed, as it is hoped, this will become one of the most important varieties for the province of Quebec. In an average year it gives a good yield in weight and a high proportion of binder. Moreover, the leaves which are too short for binders would make excellent fillers. In an unfavourable year the whole of the crop, if it were too thick for binders, might be utilized as fillers at a higher price than is generally obtained for Comstock fillers.

The Yamaska will also be tried on a field scale in 1916.

Inspection.—The inspection work which had been inaugurated in 1914 in Ontario and Quebec had to be abandoned in 1915 owing to the following reasons: In Ontario, our inspector, Mr. G. C. Routt, was called to the management of the Harrow Experimental Station, in place of Mr. W. A. Barnet, who had resigned and our Quebec inspector, Mr. P. Humbert, left for the front. Mr. Humbert unfortunately was killed in action, and his place will not be filled until after the war.

However, as regards the province of Ontario, the inspection service was reorganized towards the end of the year 1915 with Mr. H. A. Freeman as inspector. Mr. Freeman, in addition to the inspection work in a part of Ontario, will undertake a survey of the tobacco soils of Canada.

As to the growing centre situated in the immediate neighbourhood of the Harrow Experimental Station, the crop inspection work will be done by Mr. D. D. Digges, the new manager of the Station, who will thus be able to come into intimate contact with the growers of the district.

Special trips.—During the fall of 1915 and the winter of 1916 the writer made two trips to the most important centres of tobacco growing in Ohio and in Connecticut.

The object of the trip to Ohio was to try to identify the seed of Aurora, which had been sent to this Division a few years ago, by an Ohio planter, then working in British Columbia, and also to try to renew our stock of the seed.

There was no difficulty in identifying the Aurora. This tobacco has been grown for a long period in Ohio. It was even possible to examine a certain quantity of this tobacco in a packing house. However, it has ceased to be grown in Ohio for the last few years, owing to the great thickness of the leaves and the strong taste of the product.

These criticisms were evidently well founded, if this Aurora was similar to the sample that was shown. However, when grown on soils similar to those on which it was tried by this Division, this tobacco yields a much thinner leaf and much more suitable for the manufacture of cigars in Canada than in Ohio. Unfortunately it was impossible to renew the stock of seed, and if it is decided to extend the growing of this variety in Canada, the stock that was made in the first place will have to be used.

While in Ohio, the writer made as full observations as possible on the method of fermentation used in warehouses. A crop of Brazil, secured at Farnham in 1914 and which had not so far been put in proper shape to be used, was submitted to this process of fermentation. It was noted that the Ohio method, when applied to the strong Canadian products, reduces their strength to a great extent and makes them more suitable for manufacturing. There is nothing very complicated in the process.. Briefly, it is as follows: the products that have undergone a natural sweating during the previous summer are thoroughly wetted and fermented again. However, this second fermentation requires somewhat special conditions; it must be done in hot rooms where a temperature of 100-110 degrees F. may be maintained at all times.

The object of the visit to Connecticut was to study the methods of fermentation that are now generally used in this part of the United States. The main point was to ascertain whether, in Connecticut warehouses, binders, similar to Canadian binders,

are fermented in bulk or in boxes. Both methods are well known in the tobacco world, but some doubt has arisen owing to the fact that some of the Connecticut experts, who supervise this work in Canadian warehouses were using exclusively the one method, while the remainder use the other, declaring in each case that this is "the method" now being used in Connecticut. There was no difficulty in ascertaining that at the present time, in spite of the advantages of bulk fermentation, the fermentation in boxes, at least for ordinary binders is almost general throughout Connecticut. It is considered as being more economical than the other. There may still be some little doubt as to the temperature that is maintained in the rooms during the fermentation. Some warehousemen state that the temperature never rises above 85 degrees F. but the great majority, submit the tobacco during a period of more or less duration, according to the nature of the crop, to temperatures ranging from 95 to 105 degrees F.

At Ottawa, for the treatment of our binder crop of 1915, an average temperature of 100° F. was used and satisfactory results were obtained.

Fermentation.—The work at the Central Experimental Farm warehouse during the season 1915-16 mainly consisted of a test of the curing processes used in Connecticut and Ohio.

All short and thick leaves and a certain quantity of binder tobacco which had not sufficiently fermented in boxes, owing to the comparative coolness of the summer of 1914, were refermented and treated after the Ohio method. As already stated, the result was most satisfactory as regards the fillers, which are short and comparatively thick products; their strength was very materially reduced.

As to binders, it is considered that the fermentation to which they were submitted has improved them greatly, although the colour was turned darker. With regard to this tobacco, the main advantage of the process lies in the fact that the products lose this smell of "cooked" tobacco considered as undesirable by some experts and which the tobacco very often acquires during the fermentation in boxes, especially if it is packed when a little too dry.

The forced sweating, such as practised in Connecticut, was used for the treatment of the 1915 crop. Good results were obtained for all the binders and these are considered as finished, as they now only require a certain period of maturation. As to the fillers, which, perhaps, were a little dry when packed, it is considered that the fermentation to which they were submitted after being kept for almost six weeks in an atmosphere practically saturated with moisture and at about 100° F., is still insufficient to make them fit for use. They would have to be fermented again during the fall of 1916 by the method used for the Ohio fillers.

Treatment of incombustible tobacco.—During the summer of 1915 we had to handle a lot of absolutely incombustible tobacco and we tried to render it fit for use. Various salts of potassium were used for this purpose, which, according to experts, should have restored the burning quality of the tobacco. Unfortunately, the only salts that can be used in practice are the potassium nitrate and the potassium carbonate. The first is the less objectionable of the two. The potassium carbonate materially improves the combustibility of the tobacco, but it has a bad effect on the colour of the ashes, which becomes far too dark. It might, perhaps, be used on those incombustible tobaccos giving a white ash and which, after treatment with potassium carbonate, would give a gray ash, still acceptable to the trade, but products of this kind are scarce. Tobacco naturally yielding a grey ash could only be treated by the nitrate of potash, the effect of which on the colour of the ash is practically insignificant.

Publications.—During the winter of 1915-16 Bulletin No. 25 of the Experimental Farm series, entitled "The Growing of Tobacco in Canada," was published by the Tobacco Division. This bulletin, which is a revise of the old Bulletin No. A-3 of the Tobacco Division, reviews summarily the various phases of tobacco culture in Canada. It has been prepared for the use of beginners and with a view to satisfy the numerous requests for information that are received from this class of farmer.

CENTRAL EXPERIMENTAL FARM, OTTAWA.

In 1915, the trial plot at the Central Experimental Farm was used for the study and selection of certain varieties of tobacco, susceptible of yielding cigar fillers such as the Aurora and the Obourg, or pipe or cigarette tobacco, of light taste and bright colour, as the Marylands. Seeds were also produced for the free distribution which is made annually by the Tobacco Division and the selection of binders was continued.

The following varieties were grown: 2 General Grant, 2 Connecticut seed Leaf, 2 Connecticut Broad Leaf, 1 Pennsylvania Broad Leaf, 4 Big Havanas, 2 Gold Seal (Feuille d'Or), 5 Belgian (Obourg), 5 Marylands, 6 Big Ohio x Sumatra, 5 Yamaskas, 1 Persian Rose, 1 Havana Seed Leaf, 1 Miquelon, 1 Espada, 8 Comstocks Spanish, 3 Cuban x Comstocks, 2 Aurora, 1 Tabac Rouge, 1 Small Havana, 1 Canelle.

BEDS.

The beds included three semi-hot beds laid on a foundation of tobacco stems, and a hot bed laid on a layer of fermenting horse manure. The soils of these four beds were treated in the same manner; disinfection with formalin, diluted to one-fiftieth, application of chemical fertilizers at the rate of 1 ounce per square foot of bed. For the first time, mould which had been used the preceding year was again used this year. Dry seed was sown on the 23rd and 24th of April. The plants appeared on the 27th on the hot-bed and on the 29th on the semi-hot-beds. The growth was particularly rapid.

As early as the 29th, efflorescences were observed on all the beds, although the thickness of the layer of fine mould covering the part of soil mixed with chemical fertilizers was at least a good inch everywhere. A little later, it was found that what had been taken at first for efflorescence, often consisted of a thin layer of very small algæ, rather hard to detect with the naked eye.

The weather remained bright and warm from the 23rd to the 30th of April, favourable to germination and growth. It was damp and cold from the 1st to the 5th of May and then generally rather cold and often cloudy, which checked the growth of young seedlings and favoured the propagation of diseases.

The diseases made their appearance on the 19th of May. On that date, it was observed that some parts were attacked by the root rot, *Thielavia basicola,* and on the hotbed a rather large area was invaded by the *"Pythium Debaryanum";* the seedlings were yellow, appearing to be burned, checked in their growth and not forming any more new leaves.

The attacked parts were treated with crushed quicklime and with formalin. The progress of the Thielavia and the Pythium was checked and did not go beyond the already affected parts. The parts attacked by the Thielavia and Pythium recovered partially under the influence of sprinklings with nitrate of soda (solution 1-100).

The stand was not very uniform and a number of parts had to be thinned. However, the Pythium appeared on a part of the hotbed where the seedlings had never been too thick.

The various strengths of formalin used in sprinkling were: 0·5, 1, 2, and 3 per cent. When solutions of two to three per cent were used, a slight burning of the plants next to the treated parts were noted; this objection does not appear when sprinkling is done with solutions of 1 and 0·5 per cent; solutions of 1 and 2 per cent seem to be the most suitable.

Good seedlings for transplanting were secured a little earlier on the hotbed than on the semi-hot-beds; however, the latter gave seedlings at the required time. Altogether, the production of seedlings was quite sufficient. The parts of the bed near the lower frame were the best. This is exceptional. As a general rule, this is the part where the water condenses on the under surface of the sash, and this always results in an excess of moisture.

The following practical conclusions may be drawn from observations made on these beds in 1915:—

(1) New mould should be used every year in the beds, whenever possible, as the disinfection, by formalin or otherwise, of the mould used for the production of seedlings the preceding year, does not present sufficient guarantees of safety.

(2) When a bed is attacked by diseases, the local treatment with formalin, lime, or by means of any other agent should be followed by a tonic treatment, with a view to make the seedlings on the parts of the beds which have not been attacked more resistant to the infection. Sprinklings with solutions of nitrate of soda at 1 per cent have perhaps enabled us to save the majority of the seedlings.

As it was impossible to give up our beds, although they were invaded by serious diseases, the seedlings necessary for our requirements were taken out of the parts which had remained healthy or on which the plants had recovered. No case of disease was observed in the field.

Everything considered, our seedbeds were as good and perhaps better than the average seedbeds in Quebec and even in Ontario. There is no doubt that the season had some influence, as, in spite of all precautions, the growing only became normal when the outside conditions became favourable again, when more ventilation could be given and when the dampness of the soil was reduced.

Ventilation at night should be given as much as possible, even if it were only to reduce the abundant condensation which occurs during the night at the top part of the bed, causing an excess of moisture, always dangerous. Unfortunately, during the spring of 1915, it was not possible to ventilate at night as often as might have been necessary.

The comparison of maximum and minimum temperatures for May, 1914, shows that the danger of frosts disappeared in 1914 as early as the 16th of May, while another frost occurred on the 27th of May, 1915. Moreover, the temperatures during the day were considerably lower in 1915 and the weather much more cloudy. The diseases appeared on May 19, during a cold and rainy period when it was almost impossible to reduce the moisture of the mould, even by means of abundant ventilation.

OTTAWA.

SESSIONAL PAPER No. 16

OUTSIDE TEMPERATURES, Maximum and Minimum. Temperatures of the Mould. Precipitation.

1915.	Maxima.			Minima.			Rain-fall.	Temperatures of the mould.	
	1915	1914	Diff.	1915	1914	Diff.		Hot beds.	Semi-hot bed
	F°	F°	F°	F°	F°	F°	inc.	F°	F°
May 1	50·2	80·0	−29·8	39·0	28·0	+11·0	0·28	71·6	66·2
" 2	49·0	75·0	−26·0	37·4	28·0	+ 9·4	0·08	68·1	60·8
" 3	52·0	85·0	−33·0	35·0	34·0	+ 1·0	0·03	64·4	59·0
" 4	56·0	78·0	−22·0	37·0	43·0	− 6·0	.....	66·2	62·6
" 5	57·0	85·0	−28·0	44·4	51·0	− 6·6	.....	69·8	64·4
" 6	71·0	90·0	−19·0	43·0	43·0	.....	.....	69·8	64·4
" 7	60·8	77·0	−16·2	42·8	47·0	− 4·2	0·18	68·0	62·6
" 8	67·0	86·0	−19·0	49·8	40·0	+ 9·8	0·31	69·8	64·4
" 9	59·8	80·0	−20·2	46·8	45·0	+ 1·8	0·05	71·6	66·2
" 10	62·0	80·0	−18·0	34·9	46·0	−12·9	.....	64·4	59·0
" 11	65·4	68·0	− 2·6	33·8	35·0	− 1·2	.....	66·2	59·0
" 12	77·0	67·0	+10·0	42·9	48·0	− 5·1	.....	71·6	64·4
" 13	67·0	70·0	− 3·0	49·5	30·0	+19·5	0·22	77·0	71·6
" 14	60·8	70·0	− 9·2	36·4	35·0	+ 1·4	.....	71·6	71·6
" 15	58·8	67·0	− 2·2	34·8	31·0	+ 3·8	.....	73·4	62·6
" 16	52·9	72·0	−19·1	31·8	38·0	− 6·2	.....	71·6	60·8
" 17	49·0	85·0	−36·0	41·0	39·0	+ 2·0	0·18	62·6	62·6
" 18	58·2	89·0	−30·8	39·2	48·0	− 8·8	0·08	66·2	57·2
" 19	59·0	89·0	−30·0	44·0	58·0	−14·0	0·03	66·2	60·8
" 20	61·6	89·0	−28·4	36·0	47·0	− 9·0	.....	68·0	57·2
" 21	61·8	93·0	−31·2	40·9	58·0	−17·1	0·02	71·6	69·8
" 22	64·2	95·0	−30·8	50·6	53·0	− 2·4	0·28	71·6	71·6
" 23	69·0	70·0	− 1·0	47·2	49·0	− 1·8	.....	69·8	59·0
" 24	71·8	79·0	− 7·2	44·0	37·0	+ 7·0	.....	71·6	62·6
" 25	75·6	80·0	− 4·4	43·0	38·0	+ 5·0	.....	71·6	62·6
" 26	63·6	93·0	−29·4	42·8	70·0	−27·2	0·12	71·6	66·2
" 27	66·8	93·0	−26·2	31·9	58·0	−26·1	.....	68·0	57·2
" 28	71·0	80·0	− 9·0	37·0	57·0	−20·0	.....	63·0	59·0
" 29	63·6	80·0	−16·4	40·0	48·0	− 8·0	.....	69·8	60·8
" 30	73·8	85·0	−11·2	38·0	47·0	− 9·0	.....	69·8	60·8
" 31	78·6	91·0	−12·4	45·2	47·0	− 1·8	.....	69·8	64·4

NOTE.—The differences were computed in favour of the year 1915.

Observations.—The temperature of the mould in the hot-bed remained fairly constant during the month of May; that of the mould in the semi-hot-bed underwent changes which, as a rule, corresponded to the variations in the outside temperature.

As regards the outside temperature, it does not matter much how low it falls during the night as it has been clearly shown that a bed protected by glazed sashes has little to fear from night frosts. It has been noted that the period from the 15th to the 23rd of May was marked by cloudy and rainy weather. In order to keep up the temperature of the beds, the ventilation had to be checked, and then, from the 17th on, it was impossible to reduce the dampness on account of the wet weather. As already stated, the diseases appeared on the beds on the 19th. Conditions favourable to the growth of the seedlings are those that enable the grower to give a maximum of aeration, to keep a comparatively high temperature in day time, and as much sunshine as possible.

OTTAWA.

TRANSPLANTING.

The seedlings were transplanted from the 2nd to the 8th of June during comparatively cold weather for the season; the wind blowing during this time caused a rapid evaporation from the surface soil and it was necessary to water the plants.

The seedlings took root rather slowly, especially the Comstock, which seemed to have more difficulty than usual in establishing themselves. The damage caused by cutworms was not so important as usual. They were limited to the borders of the fields, especially on one side of a field of oats.

The weather remained dry from the 1st to the 10th of June. The period from the 11th to the 16th was characterized by rains, one of which, on June 13, was strong enough to pack down the soil of the plantation. Cultivation was started on the 17th, as soon as the soil was dry enough to allow the passage of implements.

Between the 16th and the 25th June the temperature remained below the average. It suddenly became warmer on the 26th. At this time the second cultivation had just been completed.

The heat remained normal, without any rain, until about the end of June. During the latter days of this month the growth was very rapid.

The first ten days of July were marked by copious and cold rains. The first heat wave began about the 10th (first hot nights from the 12th to the 13th July). The third cultivation with the horse hoe was given on the 9th and 10th July.

From the 13th to the 23rd the growth was rapid. The stand was as even as might be expected from the differences in soil composition, in various parts of the field. Hand hoeing was done on the 23rd of July by means of a garden hoe, on wheels.

As regards selection, the plants of some lots which, up to the 13th July, appeared to be quite uniform, now began to show some differences. On that date the plants were delicate, saturated with water owing to frequent rains. The weather remained cold and rust appeared on some varieties which are particularly affected by dampness. A few cases of blight were found.

Some damage was caused by grasshoppers and the Tarnished Plant Bug. They were not important, however, and were soon checked. Topping was commenced on July 28, beginning, of course, with the Canelles, closely followed by the Comstock and other small Seed Leaf.

The whole of the crop was primed from July 27 to 29. The plants were stripped of their bottom leaves up to a height of 3 to 4 inches above the level of the soil.

On July 30, thanks to the temperature which had remained favourable for about a week, although the nights were still cold, the crop showed considerable progress in growth.

From July 31 to August 2 the crop made rapid progress, but on August 2 and 3 a violent storm uprooted and threw down a large number of plants, lacerating at the same time a great many leaves. Most of the plants flattened down by the wind were made straight again on August 5. From that time on the staff was busy covering the seed plants with protecting bags.

The first signs of ripening were observed on August 11. The Canelles were harvested on that date. All the small Canadian tobaccos were ready to cut. The weather remained warm from the morning of the 10th.

OTTAWA.

From August 15 to 23 there was a rainy period, during which the plants grew without ripening. The Big Ohio x Sumatra and the Yamaska were affected by the weather conditions; they took a loose and brittle texture; they should have been harvested at once, but bad weather interfered. The following tables show the varieties grown in 1915 on the trial plots of the Central Experimental Farm;—

Distances apart.	Number of plants per acre.	Varieties grown.	Date of harvesting.	Yield in Weight.	
				Per acre.	Per arpent.
Feet.				Lb.	Lb.
3 x 2	7260	General Grant.....No. 1075	Sept. 1....	1708	1443
		" 1076	" 1....	2277	1924
		" 1077	" 1....	2258	1908
		" 1078	" 1....	1613	1363
		Connecticut Seed Leaf.....No. 1001	" 1....	1959	1655
		" (C.E.F. 1914).....	" 1....	1752	1480
		Connecticut Broad Leaf.....No. 1010	" 1....	1650	1394
		" (C.E.F. 1914).....	" 1....	1373	1160
		" (C.E.F. 1913).....	" 1....	1452	1226
		Pennsylvania Broad Leaf.....	" 3....	2420	2044
3 x 1½	9680	Big Havana.....130—6	Sept. 3....	1936	1633
		" .....138—1	" 3....	2350	1985
		" .....138—5	" 3....	2519	2128
		" .....130—1	" 3....	2218	1874
		Feuille d'or (Gold Seal).....No. 1020	Aug. 31....	1936	1635
		1021	" 3....	1861	1572
		" 1022	" 31....	1874	1583
		Belgian. (Lac St. Jean 1906).....	" 27....	1683	1422
		" .....No. 1065	" 27....	1466	1238
		" 1066	" 27....	1018	860
		" 1067	" 27....	1308	1105
		" 1071	" 27....	2482	2097
		Maryland.....No. 1045	Sept. 31–1..	1720	1453
		" 1050	" ..	1720	1453
		" .....St. Mary.....	Sept. 1....	2571	2172
		" .....Charles Co.....	" 1....	2247	1898
		" .....Prince George Co.....	" 1....	2233	1886
2½ x 1½	11616	Big Ohio x Sumatra.....No. 2025	Aug. 24....	1068	902
		" " 2026	" 24....	1612	1412
		" " 2024	" 24....	1880	1588
		" " 1082	" 24....	1936	1635
		" " 2029	" 24....	1952	1649
		" " 2022	" 24....	1824	1541
		Yamaska.....No. 1090	" 24....	1503	1270
		" 1095	" 24....	1672	1412
		" 2011	" 24....	1765	1491
		" 2002	" 24....	1416	1196
		" 2008	" 24....	1742	1471
		" 2004	" 24....	1676	1416
		Persian Rose.....	Aug. 31....	1140	963
		Havana Seed Leaf.....	" 31....	1638	1384
		Miquelon.....	" 12....	1124	949
		Espada.....	Sept. 4–9..	1750	1478
		Comstock Spanish-Mel. 1909.....	Aug. 19....	1675	1415
		" " 106–1.....	" 19....	1457	1231
		" " 109–1.....	" 19....	1827	1543
		" " 119–2.....	" 19....	1686	1425
		" " 1057.....	" 19....	1797	1518
		" " 1059.....	" 19....	1787	1510
		" " 1061.....	" 19....	1739	1469
		" " Led. 1909.....	" 19....	1458	1232
		Cuban x Comstock X^3.....	" 17....	1565	1322
		" " X^4.....	" 17....	2063	1743
		Aurora (Imported 1908).....	Sept. 1....	1340	1132
		" (C.E.F. 1911).....	" 1....	1770	1495
		Phidyme.....	Aug. 12....	1795	671
		Tabac Rouge.....	" 31....	1422	1201
2 x 1	21780	Small Havana, Bl. 1030.....	12 Aug.....	1024	865
		Parfum Italie, Bonn. 1914.....	17 "	2147	1814
		Canelle.....	11 "	1288	1088

NOTE.—For computing the yield per acre, the area of the arpent was figured at 0·845 acre.

CURING.

Harvesting was commenced on the 11th of August and completed on the 9th of September. Before being hauled to the curing barn, the plants were wilted on movable scaffolds. This wilting process, however, was delayed by the weather, it being continually cold and wet. The curing took place in a regular way, but with the danger of fermentation always present, owing to the exceptional dampness of the fall.

The curing of the ribs was completed by means of charcoal heaters. This was a rather tedious process, as it was not possible to heat up the curing house sufficiently or reduce the dampness to a minimum until most of the leaves were cured. Some of these leaves, such as the top leaves of the Maryland or those of the Pennsylvania Broad Leaf were not cured until very late. They turned yellow only after the heaters had been lighted, and the fires were regulated according to their appearance. It was endeavoured to have them become yellow, then progressively brown, while keeping them, at the same time, supple enough until complete curing of the blade of the leaves.

NOTES ON VARIETIES.

It would hardly be fair to make a definite statement regarding the merits or demerits of varieties grown in such an unfavourable season as that of 1915. As a rule, the ripening was incomplete and this had a bad influence on the colour of the products. Again, the plants were continually washed by the rains, which had an injurious effect on their texture and especially on their taste.

Maryland.—An individual selection, made in 1914, had given a series of strains, the leaves of which, after curing, ranged in colour from citron yellow to bright yellow. Several of these strains were grown in 1915. No. 1045 gives a long, pointed leaf, drooping, with large internodes, of a very bright yellow colour; No. 1050 gives a green leaf, not quite so long as in No. 1045. During the winter 1914-15, the Division was supplied by correspondents travelling in the state of Maryland, U.S.A., with reliable seed originating from the crops of St. Mary, Charles county and Prince George county. All these strains were tried 1915. The observations made on the standing crops were as follows:—

(Lot 1045) Uniform stand. At the very beginning of growth, the standing plants could be distinguished from the rest of the crop by their bright colour. However, this difference was not so marked towards the end of the season, near harvesting time.

(Lot 1050) Green leaves a little larger than those of lot 1045. A little wider in proportion to length.

(St. Mary) Pointed leaves, with a broad base, with more slanting ribs than those of 1045 and 1050 and of a dark green colour. Ribs and veins rather strong. Blade less supple and flatter than that of the Maryland 1045 and 1050, strain not quite so early.

(Charles county) Broad leaves—vertical bearing. Subject to blight. (Prince George county) Intermediate shape, between St. Mary and Charles county. Leaves very numerous, wider than those of the St. Mary.

After curing, these strains were again compared. The advantage remained with the Maryland from Charles county, considering the qualities of the tissue, the size and colour of the leaf. Lot 1045 would be second if judged by the colour alone, but the leaves are a little shorter and the tissue a little dryer and this lot only comes after the St. Mary and the Prince George county.

These conclusions are a little different from what was expected. A bigger harvest was expected from the Maryland of Prince George county as well as from No. 1045.

OTTAWA.

As to lot 1050, it did not hold out any promises as regards the production of a light coloured and fine leaf tobacco.

It is obvious that all these varieties have suffered from the conditions of the season. Lot 1045 was very promising, but the ripening was delayed by an excess of moisture and before it was completed the leaves had again become green.

This is not, however, an isolated case; it has been observed also at the station at Harrow where a lot of White Burley, which promised to give an exceptionally bright crop, started to get green again and gave extraordinarily late products which could not be cured properly.

Belgian tobacco.—Of the five selections tried in 1905, the best by far is the one originating from old seeds which had been sent in in 1906 by a Belgian settler living in Lake St. John district, P.Q.

This tobacco, which probably belongs to the Obourg variety, gives a long and firm leaf, although it could not be called thick. It is easy to cure and to handle in the warehouse. The yield in weight is good, the earliness average. When slightly fermented, it gives a pipe tobacco with a pleasant and somewhat peculiar aroma. after a longer fermentation, a good "filler" tobacco may be obtained, the strength of which may be reduced by an additional sweating.

This tobacco, which is to be tried on a larger scale in 1916, has probably a great future in the suitable parts of the province of Quebec, on all soils that are a little too heavy to produce sufficiently thin binder tobacco.

Pennsylvania broad leaf.—This tobacco was tried at the request of some cigar manufacturers, using Pennsylvania fillers. It gives considerable yield in weight but is rather late and we are not sure that the ripening was far enough advanced when it was harvested. Even at Ottawa, where, however, the fall is longer than in the good tobacco districts of the province of Quebec, it is rather hard to cure on account of the thickness of the ribs and size of the stem.

Rose de Perse.—This variety gave a very delicate plant, high and with slender stems. The leaf, of a sea green colour, rather dark, is rounded, with an acute point, and the blade is slightly undulated. The veins are fine, numerous, inserted perpendicularly on the rib. The texture of the leaves appears to be a little dry, but after curing it is fairly gummy, even a little too thick. It is subject to taking on a dark colour while curing.

This tobacco does not appear to be particularly promising, except perhaps for the raw leaf trade.

Havana seed leaf.—This variety gave a good yield in weight. It withstood the unfavourable conditions of the weather better than the Comstock and yielded products almost as supple as the latter. Generally speaking, the Havana seed leaf gives binders a little thicker but more neutral than the Comstock Spanish.

Aurora.—The crop from the seeds of the first Canadian generation of this variety was of better quality than the first crop originating from the imported seed. This fact had already been observed for the Comstock and it was mentioned at the time. The variety is not pure, several types were selected showing differences in the colour and the bearing of the leaf.

At ripening time, the leaves of the Aurora are more or less drooping, some are even completely flattened on the stem. Generally speaking the larger the leaf, the more it droops towards the soil on a strong plant.

The yield in weight is good, the earliness average, the leaves cure easily. The seed of this tobacco was imported from Ohio, where it is also known under the name of

Mexican tobacco. In Canada it gives a finer leaf than that which is generally obtained in the States. Ohio manufacturers have abandoned this type of fillers on account of its thickness and excessive strength, but it is likely that this variety will yield good products in Canada. The only objection is the shape of the leaf and the long stem, increasing the proportion of waste when stemming.

Small Havana Bl.—Small tobacco, about the size of the Canelle, as early as the latter, bearing from 8 to 9 leaves. It was grown specially for the production of seed.

Parfum d'Italie.—From commercial seed. The aroma of this tobacco has yet to be determined. It gives a thick leaf with green and few veins inserted at 90 degrees, of a rather long shape, diametral relation ½, the maximum width corresponding to half the length. Early tobacco, ranging in size between the Canelle and the Comstock Spanish.

Tabac Rouge.—From commercial seed, selected for the first time in 1914. Cuban type. About the same size as the Rose de Perse. Slender stem, rather high. Fairly early. Yields a leaf of medium thickness. It was grown in order to satisfy the request for seed of Tabac Rouge, although it has not been found that this type is the most suitable for the raw leaf trade. In this trade, however, the terms that are used for the denomination of varieties are rather vague.

Miquelon.—Tried for the first time at Ottawa. Early tobacco. Leaf of pretty oval shape, bright green colour, fine veins; distant, regular. The plant carries from 8 to 9 leaves, rarely 10. The leaves are a little larger and a little finer than those of the Canelle. The Miquelon may be planted at the same distances apart as the Canelle (2 feet by 1 foot).

The uses to which this tobacco may be put have not been determined as yet. This may possibly be discovered later, when this tobacco undergoes light fermentation, developing its aroma.

Phydime.—Grown for the first time at Ottawa. A poorly fixed type varying from the Cuban to the Small Havana. One of the numerous varieties of uncertain origin and degenerated, which some farmers are still growing instead of adopting established types of a well-known value.

Espada.—A newly introduced variety from the Philippine Islands. This is a large plant, susceptible of reaching a height of 10 feet, with a long and comparatively narrow leaf. The veins are well spaced, fairly perpendicular on the central rib. The blade is flat, of a sea green colour, a little thick and lacking in elasticity. This tobacco grows slowly. It appears to suffer from an excess of moisture and would require a summer a little drier than the one of 1915. On account of the size of the leaves, this tobacco could hardly be classed among filler tobacco; on the other hand, as a binder, it does not seem to have sufficient elasticity.

Big Ohio x Sumatra.—These varieties did pretty well in 1915 and yielded good binders. A special endeavour had been made to fix a type with an oval, rounded shaped leaf, with a thin elastic tissue, a flat blade of average length, not exceeding 26 inches.

The Big Ohio x Sumatra will be tried on a field scale in 1916. Some crossing will be done in order to stimulate the fertility which seems to have been impaired by self-fertilization under the protecting bags, used for individual selection.

Yamaskas.—All the selections of Yamaska grown in 1915 suffered greatly from the conditions of the season. The yield was satisfactory, but the leaves ripened poorly and had a thick texture. This tobacco, upon which we were counting for the production of thin binders, 20 to 22 inches long, seems to require a hot summer, not too wet.

OTTAWA.

Comstock Spanish.—All the selections grown in 1915 gave splendid binder types. It would be difficult, at the present time, to differentiate between these types without trying them on a field scale. This trial will be made with the co-operation of a number of farmers of St. Césaire.

Cuban x Comstock.—This hybrid was established in 1914 at St. Jacques l'Achigan by Mr. Paul Humbert, who was trying to secure a strain giving better tasting binders than the Comstock, the short leaves of which might be used as fillers.

The plant has a nice appearance, with a rather pronounced Cuban type. The leaf is large, almost as large as that of the Comstock, with green veins inserted at an angle of 90 degrees, but curving sharply towards the point and not so numerous as in the pure Cuban. The colour varies. Most of the time it is sea green. The plant carries from 13 to 15 leaves; the top leaves are about as long as the medium ones. The earliness is good. Judging from its appearance on the field, this variety should have given a thin leaf. However, after curing, the leaf was a little too thick for binders. It may have been affected by the climatic conditions like the Yamaska.

The General Grant and Connecticuts were grown only for the production of seed. The crop was medium, not nearly so large as in previous years.

WAREHOUSE.

The warehouse work during the season 1915-16 included the putting into marketable shape of the crop of 1914 and the fermenting of the crop of 1915.

For the first time the tobacco from the crop of 1914 had been packed directly into boxes, instead of being first fermented in bulk. These boxes were packed during the winter 1914-15, immediately after sorting. It was thought that the fermentation which generally takes place during the summer would be sufficient to put the tobacco in good marketing condition. However, when the products were examined, in October, 1915, it was found that with a few exceptions the fermentation had been very weak and the tobacco could not be marketed, even as binders.

It should be stated, however, that the summer of 1915 was particularly cold. In a normal season a sufficient fermentation might have been obtained in boxes.

It was then decided to have the crop of 1914 refermented after the method used in the Ohio warehouses. However, before adopting this process, an experiment was made to find out if the treatment of tobacco at a high temperature and while it still contains a large proportion of moisture, would have no injurious effect on the texture and the colour of the leaves.

Fermentation tests in a hot room.—Some tobacco had been damaged by hail, was in a green condition (unfermented) and of a low market value. Four lots were made and treated as follows: (Lot No. 1) Sprayed with water, on a cement floor, to be made supple. The spraying was done in three successive operations, at intervals of 24 to 48 hours, according to the condition of the products, the latter being thus suppled gradually. The object of the last spraying was to supple the top of the hands of tobacco. Between the sprayings, the products were piled in small loose heaps, surrounded with canvas, with a view to reduce evaporation as much as possible and allow the moisture to spread evenly throughout the heap.

No increase in temperature and no moulds were observed.

The quantity of tobacco thus suppled on October 5 was 266 pounds; at the time of packing the actual weight was 304 pounds. The amount of water incorporated thus represented about 15 per cent. Supposing the initial moisture was 14-15 per cent, it will be seen that this tobacco, when packed, contained 30 to 33 per cent of water (total moisture).

Lot No. 2. Suppled with water to which potassium carbonate had been added (1 per cent solution). Sprayed three times with a sprayer, as for lot No. 1. When packed, the actual weight was 287 pounds. The quantity of tobacco treated was 249 pounds, containing 14-15 per cent moisture. Total moisture at packing time, 32 to 35 per cent. Lot 3 sprayed with a 2 per cent solution of potassium carbonate. Actual weight at packing time, 294 pounds; weight of tobacco treated at 14-15 per cent moisture, 250 pounds, amount of water added, 44 pounds, or 15 per cent. Total moisture at packing time, 30 to 32 per cent.

Lot No. 4. Suppled by immersion in a 1 per cent solution of potassium carbonate, afterwards dried on a dripping table, then piled in a small heap. The quantity of tobacco treated was 223 pounds, at 14-15 per cent moisture, which, after being dried 24 hours, showed an increase in weight of 81 pounds (quantity of water absorbed by direct wetting, 35 per cent). The tobacco was turned over two or three times at short intervals, spread upon the floor and finally packed. At packing time the weight was 279 pounds, thus showing a loss of 23 pounds of water from the turning-over process, during which a considerable rise in temperature was noted. The total moisture at packing time was about 40 per cent.

This lot was placed in a hot room on the 13th and 14th October, as packing was completed, and submitted to a temperature of about 100 degrees Fahrenheit in an atmosphere almost saturated with moisture. A thermometer was placed in each box.

The temperature rose rapidly; lot No. 1 was at 120° F. after two days, lot No. 2 at 120° F. after three days, lot No. 3 at 112° F. after four days, and lot No. 4 at 125° F. at the end of a day.

On account of the rapid rise of temperature in lot No. 4, observations were made every two hours until the curb showed a tendency to go down, when all danger of accident was passed. The first fermentation in boxes was done from October 14 to November 10. During this period the temperature reached, in each box, two maxima periods between which it went down to a minimum which was recorded on the eighth day in the hot room. The boxes were opened on the 10th of November. The products were shaken, ventilated and repacked. When placed again in a hot room, lots Nos. 1, 2 and 3 went up to about 104° F., but were down again two weeks later at the temperature of the room. Lot No. 4 went up a little higher to 108° F., but it cooled down to the temperature of the room about the same day as the first three lots.

The products were then examined. No damage in texture was found in any of the lots; the colour was a little dark in lot No. 4, but fairly clear in the first three lots. The tobaccos had a distinct ammoniacal smell, hardly perceptible, however, in lot No. 1, more so in lots 2 and 3, in proportion of the quantity of carbonate of potassium employed and a little too much marked in lot No. 4. In no case were moulds observed.

It seems therefore that this method of treatment can safely be used to complete the preparation of tobacco that has undergone an incomplete fermentation under ordinary conditions, except when it is desired to have binders of a very light colour.

Treatment of the crop of 1914.—In treating other tobaccos of the crop of 1914, the Ohio method was scrupulously followed. The results were quite satisfactory, especially for a lot of Brazil grown for the production of fragrant fillers. Heretofore this tobacco had always given rather coarse fillers, although submitted to a strong fermentation in bulk. Its strength was greatly reduced by a second fermentation in a hot room and good marketable products were obtained. As to the binders submitted to this process, they took on a rather dark colour but their fermentation was completed without accident. They lost that "cooked" smell they had before being wetted, taking the clean odour, slightly ammoniacal, which is desired by the trade.

Treatment of the crop of 1915.—The crop from the stations of St. Jacques l'Achigan and of Farnham, P.Q., was treated at Ottawa during the first days of January. It was packed in boxes immediately after being sorted, but instead of being left at the

ordinary temperature to wait until the heat of summer would induce a sufficient fermentation, it was at once submitted to a forced sweating, the method practised to-day by the majority of the Connecticut packers.

After being left about two months in a hot room at a temperature of 100 degrees F. and in an atmosphere at 85-90 per cent of moisture, the boxes were examined. All the thin tobacco, classed as binders could be considered as finished; it only required a ripening which could only be achieved by time. As to the tobaccos a little thicker, classed as fillers, their fermentation was not sufficient. After the ripening which may take place during the summer of 1916, they will be again fermented at the beginning of the winter by the Ohio method.

At any rate, the fermentation took place without any incidents worthy of mention.

Conclusions.—Judging by the results obtained in 1915-16, and without losing confidence in the bulk process, it must be admitted that this process of forced fermentation gives good results, at least for the preparation of binders, and when it is desired to submit the products to a comparatively light fermentation, while keeping their colour as bright as possible.

It is economical, the products are at once protected against accident (especially moulding), and the packer is not dependent upon the conditions of outside temperature. It might be said that it is rapid if it were not necessary afterwards to let the products mature. In natural fermentation, the products mature while fermenting. In forced fermentation, the real fermentation and the ripening process are two operations, much more distinct.

PRODUCTION OF DOMESTIC MARKETABLE FILLERS.

The industry of native binders seems to be now established to stay in Canada and will likely progress rapidly.

As regards the production of "fillers" for cigars, there was a deficiency to be supplied.

In some parts of Canada it is easy to obtain fragrant tobacco that may be used as fillers. If the aroma was the only thing to be considered, it might be said that the problem has been solved by the introduction of the Aurora, the Brazil, the Belgian, the Zimmer Spanish and some Pennsylvania varieties. But leaving out the yield in weight per acre, which, however, must be taken into account in order to find out the cost of production and therefore the price at which the product should be sold to the warehousemen, the strength in nicotine of Canadian tobacco fillers was considered as an almost insurmountable obstacle to their being taken for the manufacture of cigars.

The result of experiments made in 1915-16, shows that the strength of these tobaccos may be reduced as required by submitting them to a second fermentation, such as practised in Ohio.

Of course, this treatment increases the expenditure, but this increase is largely compensated by the increase in value of the product. During the season 1915, a few cigars were manufactured with Cuban fillers and Canadian Aurora. These products had not been refermented; it can be safely asserted that if they had been, the proportion of favourable answers received from manufacturers to whom these cigars were submitted would have been much larger.

EXPERIMENT ON THE IMPROVEMENT OF INCOMBUSTIBLE TOBACCOS.

On account of mistakes made in the use of commercial fertilizers, some Quebec farmers obtained in 1914-15 tobacco which was almost incombustible. In some cases the analysis of the chemical fertilizers revealed the direct cause. The influence of these fertilizers on the quality of the product was made still stronger by the cold and rainy season.

The majority of authorities who have studied the question of incombustible tobacco, recommend the use of organic salts of potassium, tartrate, citrate, oxalate, malate of potassium, by means of which the proportion of potash combined with organic acids may be increased in the leaf. Others state that quite as good results may be obtained by the use of nitrate or carbonate of potassium.

In these experiments potassium tartrate, citrate, oxalate, nitrate and carbonate were used as well as two formulas of ready-made solutions, found in the trade, and which, according to their inventors, would make fit for use the most incombustible products. The solutions which were prepared by us contained respectively 1, 2 and 5 per cent of potassium; those supplied by the trade were used according to the instructions contained in the circulars.

In no case was it found possible to make the products sufficiently combustible to burn in the leaf. However, the cigars manufactured with these treated tobaccos all remained alight for a sufficient length of time, varying with the product employed and the concentration of the solution.

Although the products dealt with were almost entirely incombustible, they were made fit to burn by the use of 2 per cent solutions. In almost every case, 1 per cent gave a combustibility of over three minutes.

Unfortunately, the colour of the ashes was almost always far too black; it became of a dark grey after the cigars had been left to dry for some time.

The best results as regards the colour of the ashes were given by potassium nitrate. However, one must be careful not to apply an exaggerated dose of this product, otherwise cigars might be obtained that would "fuse" when lighted. It is seldom necessary to use a solution of potassium nitrate containing more than 1 per cent of potassium, which correspoonds to about 2·5 per cent of refined saltpetre. As combustibility is only comparative, it is only by a previous test that one may know exactly the quantity of nitrate that should be used to make a given lot of tobaccos marketable.

One of the most serious objections to the use of organic salts of potassium is that some of them, like citrate and tartrate, encourage the growth of mould. All of them, as well the organic as the mineral salts, influence the taste of the products if the quantity employed is at all considerable.

CONTROL OF MOISTURE.

One of the most difficult problems that face the warehousemen is the control of moisture in rooms where tobaccos are being handled. The degree of moisture should vary according to the nature of the work, but it should always be such that the products may not completely dry out. This problem becomes quite complicated in rather small warehouses, where the variations of temperature are always more sudden and more frequent than in large ones.

Two "Hygrossos" were placed in the warehouse of the Central Experimental Farm. When this apparatus works normally it is not difficult to keep the moisture to about 85 per cent. However, this is a dangerous limit if the products remain exposed for some time in such a saturated atmosphere, unless the temperature of the room stays between 90 and 105 degrees F.

For bulk fermentation, a proportion of moisture of 80 to 85 per cent in rooms that are kept at a temperature of 75° to 80° F. is too high. Condensation occurs at the top of the bulk, and moulds rapidly develop there, and even on the top of the hands, all around the bulks. The growth of mould is completely checked when the humidity is brought down to 55 or 65 per cent without modifying the temperature of the room. Under these conditions, the inside of the bulk of tobacco remains supple and the products along the edge of the heap have a tendency to dry out slightly, but without becoming brittle.

When tobacco, instead of being fermented in bulk, is packed in boxes and left at an ordinary temperature while waiting for the heat of summer, it seems that the

moisture of the room could be made higher and kept in the neighbourhood of 80 per cent. Under these conditions, the packed products only dry out very little on the outside and not at all inside; the summer fermentation is thus stronger.

Sound tobacco packed in bales has been kept for two months without any signs of mould in a room where the temperature ranged from 70 to 80 degrees F., and where the proportion of moisture reached 85 per cent most of the time.

A precaution which is indispensable if one wishes to avoid the rapid formation of mould is frequently to ventilate the rooms, no matter what the degree of humidity may be, in order to avoid the accumulation of foul air.

Except in very cold weather, the opening of the ventilators, even for a long time, does not materially reduce the degree of moisture in the rooms where hygrossos or any other spraying apparatus are kept in operation.

DISTRIBUTION OF SEED.

During the year 1915-16, 3,239 samples of tobacco seed were distributed as follows:—

Comstock Spanish	1,048
Canelle	828
Connecticut Seed Leaf	301
Connecticut Broad Leaf	143
General Grant	202
Tabac Rouge	130
White Burley	130
Havana Seed Leaf	99
Petit Havana	113
Big Havana	113
Cubain	30
Parfum d'Italie	29
Blue Prior	21
Warne	18
Belge (Obourg)	25
Feuille d'Or	2
Yamaska	3
Rose de Perse	2
Big Ohio X Sumatra	1
Montmelian	1
	3,239

EXPERIMENTAL TOBACCO STATION, FARNHAM, QUE.

REPORT OF THE MANAGER, O. CHEVALIER, I.N.A.

SOWING.

The seed beds were set up on April 6, under good conditions and a very favourable temperature. The vegetable earth (mould) had been disinfected as follows:—

1. One-half treated with a solution of formalin at 1/50 (1 gallon of formalin to 50 gallons of water).

2. The other half at 1/100 (1 gallon of formalin to 100 gallons of water).

Two sprayings of this solution were applied directly on the bed. The fine mould which was to form the top part of the beds was treated separately with a formalin solution at 1/100.

Out of 20 beds of 21 feet by 5 feet, ten were laid on a foundation of tobacco stems and the rest were placed directly upon the earth. In both cases, two different thicknesses of mould were used, 6 and 9 inches, with a layer of fine earth of a uniform thickness of one inch everywhere.

The space of two sashes (30 square feet), was set apart for a hot-bed made up as follows: 1 foot of manure well packed, 6 inches of mould, 1 inch of fine earth.

Immediately after the treatment with formalin, the sashes were laid down and four days later the top of the beds was worked with a rake. Fine mould was spread and the bed was submitted to the action of the sun during four days. A temperature of 95 degrees F. was recorded several times.

All the seeding was over on the 17th of April, at night. As usual, the seed was sown at the rate of one-seventh of an ounce per 100 square feet of bed, and cornflour was mixed with the seed.

The following varieties were sown:—

Amount.	Variety.	Obtained from.	When obtained.
3 beds	Big Ohio x Sumatra	St. Césaire	1911
3 beds	Comstock Spanish	Melançon	1909
2½ beds	Havana Seed Leaf	Pommeroy	1913
2½ beds	Yamaska	Rouville	1910
3 beds	Aurora	C. E. F.	1911
1 bed	Warne	Harrow	1909
1 bed	Virginia x Herzegovina	C. E. F.	1914 (Series No. 39)
1 bed	Connecticut Seed Leaf	C. E. F.	1913
1 bed	General Grant	C. E. F.	1914
1 sash	Small Havana	C. E. F.	1914
1 sash	Big Havana	C. E. F.	1914
1 sash	Maryland	C. E. F. 1045	1914
		C. E. F. 1050	1914
		St. Mary Imported	1914
		St. Charles Imported	1914
⅓ sash	Cuban (Imported)		1913
½ sash	Cuban (Imported)		1908
⅓ sash	Connecticut Broad Leaf	C. E. F.	1914
⅓ sash	Big Ohio	C. E. F.	1913
⅓ sash	Sumatra (original seed)		
⅓ sash	Comstock selections	Farnham 4011	
		Farnham 4013	
½ sash	Comstock selections	Ottawa 1055	
		Ottawa 1058	
⅓ sash	Big Ohio x Sumatra selections	Farnham 4001	
		Farnham 4006	
		Farnham 4010	
		St. Jacques 2029	
		St. Jacques 2027	
		St. Jacques 2022	
⅓ sash	Yamaska selections	St. Jacques 2010–Y–1	
		St. Jacques 2007–Y–2	
		St. Jacques 2009–Y–2	
		St. Jacques 2002–Y–2	

On Friday, April 30, all the plants were up, with the exception of the Cuban, which did not germinate.

The month of April was exceptionally hot. There were several storms, particularly during the night of the 24th and the 25th. In general, farm work was fourteen days ahead of 1914 at the corresponding date.

The following comparison of temperatures is interesting:—

1914. April 27—Max. 50 degrees F.; Min. 34 degrees F.
1915, April 27—Max. 83 degrees F.; Min. 51 degrees F.
In 1914 the tobacco was not up until May 6.

Unfortunately this rate of progress was not maintained. The month of May was very cold. Several frosts were recorded on the 10th, 13th and 14th; on the 15th the thermometer went down to 27° F. On the 26th the minimum recorded was 30½° F.

Then the seedlings ceased to grow and the beds looked very unpromising. They became very damp, and in spite of abundant ventilation mushrooms appeared almost everywhere. Fortunately these mushrooms, which belong to the Ascomicetes (Pezizes), were easy to remove. However, all the seedlings remained healthy, but their growth was checked.

An attempt was made to stimulate the growth by watering with the following: A solution of nitrate of soda, ¼ pound for 10 gallons of water; a solution of hen manure, one of concentrated solution for 10 gallons of water.

On May 27 the seedlings had recovered their strength, and the danger was passed.

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NOTES ON THE SEED BEDS.

When the beds are established on a well drained site, a condition which is always easily secured when the level of the beds is raised above the ground, it is not necessary to use a layer of tobacco stems or other insulating material. These tobacco stems are not required for drainage purposes when care is taken not to water the beds too copiously.

Seedlings grown on hot-beds are often spindly and of inferior quality because they grow too quickly. Seedlings obtained on cold beds are slow at starting perhaps, but they are hardy and full of vitality. There is no doubt that the use of the cold bed is a sort of natural selection.

There is a considerable difference between the temperature of the air and that of the soil in a bed, and it has been found that the greater this difference is, the slower the seedlings grow. The atmosphere of the bed is always warmer than the soil of the bed. By controlling the entrance of air, by means of a white canvas, spread over the sashes, this difference is reduced to a large extent and to the great advantage of the seedlings.

This difference between the temperature of the atmosphere of the bed and that of the soil varies with the outside temperature. For instance, when the outside temperature is 105° the difference is 5°; when it is 90° the difference is 13°. When the sashes are not covered with canvas, enormous differences of temperature are observed. It would therefore appear that the use of white canvas reduces to a minimum these differences of temperature.

As soon as the seedlings have five leaves it is advisable slightly to raise the sashes during the night, provided the outside temperature is not too cold. Under these conditions the seedlings grow much better. Every one knows that plants breathe at all times, but that they do not throw off any oxygen during the night. Therefore, in a bed that is tightly closed there is always more carbonic acid in the morning than in the evening. This may be easily observed by noting the change that takes place in a glass of lime water, placed in the bed. When the bed is kept slightly open during the night the amount of precipitation in this glass is about the same, day or night.

The seedlings grown on a bed well ventilated at all times, day and night, are always stronger, hardier and healthier than those that are not well ventilated. It is advisable, therefore, to open the sashes at night as much as possible, to use very large frames and to leave as much space as possible between the level of the soil in the bed and the glazed sashes on top, as this provides an atmosphere with a maximum capacity.

VARIETIES TESTED.

The plantation covered some 15 acres of tobacco, including the following varieties:

	Arpents.
Big Ohio x Sumatra	2
Yamaska	2
Comstock Spanish	2
Aurora	2
General Grant	1
Connecticut Seed Leaf	1
Havana Seed Leaf	2
Warne	1
Virginia x Herzegovina	1
Small varieties under test	(see seed-beds). 1

It may be said that the year 1915 was, on the whole, very unfavourable for the growing of tobacco. The spring was early and the seedlings in general came up well, but as soon as transplanting was over the weather turned very cold and damp. The growth was at a standstill during the month of June. The seedlings took root with great difficulty and a great many had to be reset, chiefly on account of cutworms.

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The month of July was not very much better, there being a few hot days, but a long drought. The month of August saved the situation, the tobacco grew very quickly, and, of course, the expected happened; this tobacco, which had grown too fast after remaining stationary for a long period, had very little body and elasticity; most of the leaves were like the bottom leaves in a normal year.

The small experimental varieties, tried on a new ground, were greatly affected by the poor weather conditions. The individual selection which it was proposed to make could not be carried out. However, the hybrid Big Ohio x Sumatra was re-created with some degree of success. (Eight flowers were artificially fertilized out of ten that had been crossed.)

None of the other varieties having ripened, no conclusions could be drawn.

A summary of the work done on our plantation is given in the following table:—

Variety.	Date of planting.	Distances	P.c. of resetting.	Number of hoeings.	Topping.	Number of suckerings.	Date of harvest.
			%				
Big Ohio	June 7	½ to 24″ x 36″ / ½ to 18″ x 30″	14	6 hoeings. (3 by	Aug. 10	2	Aug. 27
Yamaska	June 7 & 8	18″ x 30″	16	horse hoe	" 10	2	" 30
Comstock	June 9	18″ x 30″	22	and 3 by	" 11	2	Sept. 2
Connecticut S.L.	" 10	18″ x 30″	18	hand.	" 12	2	" 4
Havana Seed Leaf	" 12	18″ x 30″	34		" 13	2	" 6
Aurora	" 11–12	18″ x 30″	21 / 50		" 13	3	"
General Grant	" 14	24″ x 30″	26 / 50		" 17	—2nd at harvest.	" 7
Warne	" 15	18″ x 30″	17		" 24	"	" 15
Virginia-Herzegovina	" 15	18″ x 30″	16		" 24	"	" 15

YIELDS.

The following yields were obtained:—

——	Bottom leaves.	Medium leaves.	Top leaves.	Refuse.	Total.	Yield per arpent.
	lb.	lb.	lb.	lb.	lb.	lb.
Comstock	237	807	685	262	1991	995·5
Big Ohio x Sumatra	535	1174	642	137	2488	1244
Havana Seed Leaf	284	1003	458	206	1951	975·5
Yamaska	257	509	419	141	1326	678·
Aurora	386	1091	506	56	2039	1019·5
Connecticut Seed Leaf	156	507	224	63	950	950·
General Grant	168	583	292	178	1221	1221·

The best yields in quality and quantity were given by the Big Ohio x Sumatra. The Yamaska was a little too green. The Comstock was lacking in body as well as the Havana Seed Leaf. The General Grant and the Big Ohio x Sumatra gave the best yield per arpent, 1,221 pounds and 1,244 pounds respectively. This is a very good yield for a binder tobacco.

Selection.—The selection of the Big Ohio x Sumatra was one of the main objects of the work. It has been shown that the selection of experimental varieties was not resumed this year, owing to the failure of the seedlings. Some 300 seed plants of Big Ohio x Sumatra were selected and the following types were finally secured:—

Selection No. 415. A very large plant, numerous leaves, close set, flat, with a supple point, fine dark green colour, thin veins, early plant.

Selection No. 418. Same characters as selection 415, but more perfect still; especially on account of the shape of the leaves, which are flatter.

Selection No. 419. Large plant, leaves 38 inches long, but slightly undulated. This strain should be tried under canvas.

A mass selection of the Havana Seed Leaf was also made and some four pounds of choice seeds were harvested.

The seed pods ripened very late in 1915 and as early fall frosts were expected, the seed plants were put under shelter. These seed plants were pulled out, care being taken to leave as much earth as possible adhering to the roots, and put in a trench one foot deep. The whole was covered at night by canvas and sashes, laid on a wooden frame. This frame was made with the scaffolds and supports that are used for wilting tobacco on the field. The quantity of seed obtained would have been very much larger had it not been for the damage caused by rats and mice during the drying period.

FLUE CURING.

Two varieties of bright tobacco were cured under artificial conditions this year: the Warne and an Italian hybrid; the Virginia x Herzegovina. Both these varieties had been unable to ripen completely owing to the unfavourable season, and were not therefore in a good condition for kiln treatment, specially the Virginia x Herzegovina.

The Virginia x Herzegovina was the first to be treated. The following is a summary of operations:—

Fires were lighted on the 16th of September at 4 p.m. until a temperature of 85° F. was reached; this temperature was maintained for thirty-six hours. In two hours the temperature was raised to 105° and kept at that point until 6 p.m. the same day. Later on the temperature was gradually raised at the rate of two degrees per hour until it reached 130° F. At that time the yellowing appeared to proceed very favourably. Up to this time the top ventilators had been left half open. In three hours the temperature was raised to 135°, then increased 1 degree per hour up to 140°. A very sudden drying up took place at that time and the colour did not undergo any further change. All endeavours to make the products more supple were unsuccessful and the drying out of the tobacco had to be completed. This drying out process was completed on the 21st, at 8 a.m., at the final temperature of 175° F. At 155° F. both leaves and veins were dried and stems were beginning to get dry. The operation might have been stopped at 170° F.

The yellowing commenced perfectly, but owing to a phenomenon that we are unable to explain, the tobacco suddenly became very dry and the change in colour no longer proceeded, because it was impossible to restore to the leaves the slightest amount of moisture. Only greenish, more or less dark leaves were obtained, and not a single yellow leaf.

It was then decided to leave the tobacco in the kiln, while the Warne was being treated, in the hope that its colour might be improved by the moisture coming out of the Warne. The Warne was treated exactly as the Virginia x Herzegovina had been in order to find out the critical point which had determined the stop in the changing of colour in the first operation. However, this accident did not recur with the Warne.

The second operation was fairly successful, considering the circumstances and the poor condition of the Warne (damaged by the wind, the rain and more or less flattened by the fall of the scaffolds during the violent storm of September 19).

The condition of the Virginia-Herzegovina was greatly improved by the second operation, as a fairly large number of bright yellow leaves were found. The most practical lessons taught by the result of these two experiments are, perhaps, the fol-

lowing: (1) A tobacco which is cured too quickly remains green (the same accident happens in ordinary curing). (2) By reincorporating a certain quantity of moisture in this tobacco, one may considerably improve its colour and probably obtain a perfect yellow.

The yields obtained with the two flue-cured varieties are given in the following table:—

Varieties.	Yellow No. 1	Yellow No. 2	Green	Total
	lb.	lb.	lb.	lb.
Warne	27	127	91	245
Virginia-Herzegovina	20	311	107	438
				683

The yield of 245 pounds for the Warne may seem rather low but it should be noted that about one-third of the crop only was treated, the rest having been destroyed by the storm.

OTHER CROPS.

In accordance with the three-year rotation that was adopted, oats and clover are grown in connection with tobacco.

The seeding was done very early in the spring and under very favourable conditions. Some twenty-two arpents were sown to oats and clover at the rate of 1½ bushels of oats and 15 pounds of clover per arpent.

The oats gave 836 bushels or an average yield of 28 bushels per arpent, or a total of 28,424 pounds, if the weight of the bushel is computed at 34 pounds. Thirteen tons were forwarded to Ottawa, with a good proportion of our straw crop which reached a total weight of 16 tons and 830 pounds.

Fourteen arpents of clover gave 35¼ tons of hay of very good quality.

The soil for our plantation in 1916 was prepared in the fall. Twelve carloads of manure were ploughed under by deep ploughing, made with the double Brabant plough. In addition to the manure, about 30,000 pounds of tobacco stems were also incorporated with the soil.

EXPERIMENT WITH CHEMICAL FERTILIZERS.

In 1914, an experiment with chemical fertilizers had shown that the following formula was the most profitable:—

250 pounds sulphate of ammonia per arpent.
180 pounds of sulphate of potash per arpent.
80 pounds of superphosphate per arpent.

This experiment was resumed in 1915. The following initial formula was used as in the previous case.

250 pounds sulphate of ammonia per arpent.
150 pounds of sulphate of potash per arpent.
100 pounds of superphosphate per arpent.

A similar experiment was also carried on in which the superphosphate of the above formula was replaced by basic slag.

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A field of two arpents was divided into 32 even lots, receiving the following per arpent:—

Lot No.	1—300	lb.	sulphate of ammonia,	180	lb.	sulphate of potash,	120	lb. superphosphate.
"	2—250	"	"	150	"	"	100	"
"	3—200	"	"	120	"	"	80	"
"	4—150	"	"	90	"	"	60	"

As may be seen, the original formula was applied and its constructive elements were changed in the same proportion.

EXPERIMENT WITH PHOSPHORIC ACID.

Lot No.	5—250	lb.	sulphate of ammonia,	150	lb.	sulphate of potash,	120	lb. superphosphate.
"	6—250	"	"	150	"	"	100	"
"	7—250	"	"	150	"	"	80	"
"	8—250	"	"	150	"	"	60	"

EXPERIMENT WITH NITROGEN.

Lot No.	9—300	lb.	sulphate of ammonia,	150	lb.	sulphate of potash,	100	lb. superphosphate.
"	10—250	"	"	150	"	"	100	"
"	11—200	"	"	150	"	"	100	"
"	12—150	"	"	150	"	"	100	"

EXPERIMENT WITH POTASH.

Lot No.	13—250	lb.	sulphate of ammonia,	180	lb.	sulphate of potash,	100	lb. superphosphate.
"	14—250	"	"	150	"	"	100	"
"	15—250	"	"	120	"	"	100	"
"	16—250	"	"	90	"	"	100	"

In the following lots the superphosphate was replaced by Thomas basic slag:—

EXPERIMENT WITH POTASH.

Lot No.	17—250	lb.	sulphate of ammonia,	180	lb.	sulphate of potash,	100	lb. slag.
"	18—250	"	"	150	"	"	100	"
"	19—250	"	"	120	"	"	100	"
"	20—250	"	"	90	"	"	100	"

EXPERIMENT WITH NITROGEN.

Lot No.	21—300	lb.	sulphate of ammonia,	150	lb.	sulphate of potash,	100	lb. slag.
"	22—250	"	"	150	"	"	100	"
"	23—200	"	"	150	"	"	100	"
"	24—150	"	"	150	"	"	100	"

EXPERIMENT WITH PHOSPHORIC ACID.

Lot No.	25—250	lb.	sulphate of ammonia,	150	lb.	sulphate of potash,	120	lb. slag.
"	26—250	"	"	150	"	"	100	"
"	27—250	"	"	150	"	"	80	"
"	28—250	"	"	150	"	"	60	"

EXPERIMENT WITH ORIGINAL FORMULA.

Lot No.	29—300	lb.	sulphate of ammonia,	180	lb.	sulphate of potash,	120	lb. slag.
"	30—250	"	"	150	"	"	100	"
"	31—200	"	"	120	"	"	80	"
"	32—150	"	"	90	"	"	60	"

The chemical fertilizer was spread by hand on the 4th of June and the seedlings were planted with a machine on the 7th June; the variety used in this experiment was the Big Ohio x Sumatra. It should be stated that 15 tons of farmyard manure to the arpent had been applied to the experimental field during the fall ploughing.

In order to ascertain the yield, the plants grown on each lot had been counted, the corresponding leaves had been weighed and the results computed per arpent, it being admitted in practice that an arpent of Big Ohio x Sumatra contains about 7,500 plants of tobacco.

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The results obtained are shown in the following table:—

SERIES NO 1 (SUPERPHOSPHATE).

Number of lots.		Number of plants.	Weight obtained.	Yield per arpent.
			lb.	lb.
(A)	1	410	104	1900
	2	365	91	1869
	3	405	82	1518
	4	317	58	1372
(B)	5	350	93	1992
	6	265	66	1868
	7	260	56	1615
	8	356	76	1557
(C)	9	355	81	1711
	10	345	67	1456
	11	290	63	1629
	12	265	49	1462
(D)	13	270	49	1360
	14	360	70	1479
	15	260	41	1185
	16	285	52	1368
Average for the 16 lots				1583

SERIES NO. 2.

Number of lots.		Number of plants.	Weight obtained.	Yield per arpent.
			lb.	lb.
(A)	17	355	64	1352
	18	310	58	1403
	19	295	65	1652
	20	154	32	1558
(B)	21	235	45	1468
	22	345	65	1413
	23	322	59	1374
	24	405	59	1092
(C)	25	355	78	1648
	26	354	58	1228
	27	265	55	1556
	28	286	52	1363
(D)	29	175	53	1768
	30	223	51	1715
	31	255	55	1555
	32	125	25	1560
Average for the 16 lots				1481

The following table will enable the reader to compare the results:—

SERIES NO. 1.

GENERAL FORMULA.

Number of lots.		Sulphate of Ammonia.	Sulphate of Potash.	Superphosphate.	Yield in Weight.
Series A	1	300	180	120	1900
	2	250	150	100	1869
	3	200	120	80	1518
	4	150	90	60	1372
EXPERIMENT WITH PHOSPHORIC ACID.					
Series B	5	250	150	120	1992
	6	250	150	100	1868
	7	250	150	80	1615
	8	250	150	60	1557
EXPERIMENT WITH NITROGEN.					
Series C	9	300	150	100	1711
	10	250	150	100	1456
	11	200	150	100	1629
	12	150	150	100	1462
EXPERIMENT WITH POTASH.					
Series D	13	250	180	100	1369
	14	250	150	100	1479
	15	250	120	100	1185
	16	250	90	100	1368

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SERIES NO. 2.

EXPERIMENT WITH POTASH.

Number of lots.	Sulphate of Ammonia.	Sulphate of Potash.	Basic Slag.	Yield in Weight.
	lb.	lb.	lb.	lb.
Series A 17	250	180	100	1352
18	250	150	100	1403
19	250	120	100	1652
20	250	90	100	1558

EXPERIMENT WITH NITROGEN.

Series B 21	300	150	100	1468
22	250	150	100	1413
23	200	150	100	1374
24	150	150	100	1092

EXPERIMENT WITH PHOSPHORIC ACID.

Series C 25	250	150	120	1648
26	250	150	100	1228
27	250	150	80	1556
28	250	150	60	1363

GENERAL FORMULA.

Series D 29	300	180	120	1766
30	250	150	100	1715
31	200	120	80	1555
32	150	80	60	1560

CONCLUSIONS.

An examination of the results obtained in the two series of experiments, first series with superphosphate and second series with basic slag, shows that the treatment with superphosphate gave the best results: 1,583 pounds against 1,481 pounds for the basic slag, being a difference of 103 pounds in favour of the superphosphate.

Series No. 1.—Although lots 2, 6, 10 and 14 received the same quantity of chemical fertilizers, the yields obtained vary considerably. The results on 2 and 6 are identical; they are also the same on 10 and 14, but there is a great difference between group 2-6 and group 10-14. This difference, which appears to be abnormal, might also be explained by the differences noted in the composition and the nature of the soil.

The best yields are given by lots 1 and 5, closely followed by lots 2 and 6.

The lot which received the maximum quantity of chemical fertilizers in the three formulæ produced 1,900 pounds. Lot No. 5 gave a slightly better yield than lot 1, although it had received 50 pounds of sulphate of ammonia and 30 pounds of sulphate of potash less than lot 1. The natural conclusion is that the quantity applied to lot 1 was rather too high for good results. It would seem, therefore, that the best quantity of sulphate of ammonia is 250 pounds. Above this quantity the yields are lower.

As regards potash, it may be stated that potash employed as a sulphate at the rate of 150 pounds gives the best results; also, that potash only seems to influence the

yield, as the combustibility remains good in all cases. Under 150 pounds of sulphate of potash per arpent, the yields are not so good.

The maximum yields, 1,900 pounds and 1,992 pounds, correspond to the largest quantity of phosphoric acid that has been tried. Therefore, it is not possible to say whether the optimum quantity was reached with phosphoric acid. These observations on the influence of phosphoric acid are, perhaps, the most striking of these experiments, and it would probably have been very interesting to use 140 and even 160 pounds on some lots.

Judging from the results given by the experimental series No. 1, the following formula might be recommended:—

250 pounds of sulphate of ammonia.
150 pounds of sulphate of potash.
120 pounds at least of superphosphate.

Series No. 2.—In series No. 2 the same general observations might be made as regards the difference in the yields of lots treated exactly the same way.

In this series the differences are still large, especially as regards lot No. 30 and lot No. 26.

The maximum yield was secured on lot No. 29: 1,766 pounds. This is the lot which had received the largest quantity of fertilizers.

The influence of phosphoric acid is also well marked. With 120 pounds of slag, a yield of 1,766 pounds (No. 29) was secured and with 60 pounds of slag the yield was 1,363 pounds.

However lot No. 26 prevents definite conclusions being made.

Section B shows that nitrogen is necessary, as the yields increase in proportion with the sulphate of ammonia that is used.

As regards potash it is hard to draw any conclusions, as it seems from the examination of section A that it is not advisable to apply a large quantity of potash.

As to basic slag, its use is perhaps unnecessary, seeing that the best results were given by series No. 1. To conclude, the adoption of the formula based upon the results given by series No. 1 is recommended.

DRAINAGE.

In 1915 a plot of eleven arpents between the lines of the Canadian Pacific railway and the Central Vermont railway was underdrained. The nature of the soil and subsoil was ascertained by means of borings. This nature is as follows:—

1. A layer of arable soil, 10 inches thick, made of very fine grey sand, with a little clay.
2. A layer of clayey and yellow sand, 20 inches thick.
3. A layer of marly blue sand, extending down to the water level.

On account of the nature of the soil and of its composition, the following method was adopted: The small tiles were laid parallel with the line of the greatest slope and connected with the large tiles at an angle of 30 degrees. They were placed forty-five feet apart; the first tile is 3 feet 9 inches deep; the slope increases regularly but never exceeds 0·068 per cent.

The water from the small drains is collected in main drains, 6 inches in diameter. In order to avoid the construction of an expensive outlet, the main collector had to be run across the road. Some 6,284 feet of drain were required for this work.

WILTING ON THE PLANTATION.

In order to secure good results, it is necessary that the tobacco plants remain as little as possible in contact with the soil after being cut. On the Farnham Station not a single tobacco plant comes in contact with the soil. They are at once strung on

the laths and these are laid on scaffolds, in the same position that they are to occupy in the curing barn. These scaffolds are covered with cloth, 15 feet by 30 feet, and thus sheltered from the wind, the sun and the rain.

This wilting on the field is recommended, as it cuts off about ten days from the time necessary for curing.

An experiment was made on two arpents of Comstock; the crop of one arpent was at once hauled to the curing house and the other was left four days on the field. The first crop was absolutely green when put in the curing house; the other one was already in an advanced stage of yellowing, and when the tobacco was stripped it was found that the crop which had been wilted on the field was ten days ahead of the other.

However, some precautions are required in wilting tobacco in the field; for instance, the laths must not be put too close together upon the scaffolds. The tobacco must be protected as well as possible from the wind, and specially from the noon sun, which may be very injurious. This protection may be given by means of cloth. This cloth must be removed during the day and the products ventilated as often as the weather conditions will allow.

CHARCOAL FIRE HEATERS.

The curing of tobacco has always been a delicate point in the province of Quebec. Atmospheric conditions are rarely favourable to good curing. Very often, when the tobacco is taken down for stripping, it is found that it has cured green, that it is damaged by pole burn, or that it contains too many fat stems.

The charcoal heaters used have been described in a previous report. It is not necessary, therefore, to deal again with this matter or with the method of use.

One heater is sufficient for three hundred square feet.

These heaters may be very useful, but they may also be very injurious in inexperienced hands.

Care should be taken not to give too much heat, as tobacco might cure in a green condition. Sufficient space must be left between the heaters and the tobacco plants, or the latter may deteriorate. The fires must be conducted so that the tobacco, while curing, will remain supple at all times. If, after heating for some time, the outside atmosphere is very damp and the tobacco brittle, one may be sure that the operation is a failure, as in this case the tobacco will become supple again in too short a time, and this condition greatly favours the growth of mould and the formation of fat stems.

PROTECTION AGAINST FROST.

Several frosts were recorded during the month of August and at the beginning of September and some measures had to be taken to counteract their effect.

Several methods were tried, and the following is recommended:

In the first place, one should closely watch the thermometer in order to note the fall in temperature and thus foresee a frost. The most critical time is about two o'clock in the morning. As a general rule when a lowering of three degrees F. per hour in the temperature is noted at 8 p.m., one may be practically sure that it is going to freeze. In this case fire-pots should be placed around the plantation, to windward of course. The idea is to produce over the field a cloud of smoke, more or less thick, the object of which is to reduce the cooling of the soil and to delay as much as possible the precipitation of dew.

Many growers are under the impression that the frost is avoided by heating the field. This is a mistake, as it is almost impossible to heat a field. The only thing that can be done is to check radiation of heat and the consequent cooling of the soil. This may be done by forming an insulating layer between the crop and the atmosphere. The

following method has given the best insulating layer: very damp straw, well packed and saturated with coal oil, is put in the fire-pots; this straw is covered with about 1½ pounds of tar, then with charcoal, and the whole is covered again with damp straw. The fire is set, and very soon the field is covered with a thick cloud of smoke. One fire-pot every fifty feet is quite sufficient. Of course, the fires have to be watched and maintained but this does not require very much work. When the wind is very strong, there is not much danger from frost, but when the night is clear and quiet and when the atmosphere is calm, it is well to be on one's guard. The method that has just been indicated is simple and economical; the only precaution is to observe the direction of the wind so as to put the fire-pots where they should be. It often happens that the fire-pots may have to be moved two or three times during the night. After 5 a.m. all danger is passed. This method of protection against frost is very efficient. On the 20th, 30th, and 31st of August, frost caused a great deal of damage to the crops of the district, but it had no effect whatever on the Farnham station, thanks to these precautions, although the temperature fell to 24 degrees Fahrenheit.

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ST. JACQUES L'ACHIGAN STATION.

REPORT OF THE MANAGER, O. CHEVALIER, I.N.A.

Four varieties of tobacco were to be studied in 1915:—

1. The Aurora.
2. The Connecticut Broad Leaf.
3. The Connecticut Seed Leaf.
4. A variety of Belgian tobacco.

On April 2 the setting up of the beds was commenced, as follows: Setting down of the frames, building up of a layer of tobacco stems, disinfection of vegetable earth with formalin (one gallon of formalin to 100 gallons of water). This disinfection was done in three operations. A complete fertilizer at the rate of 1/16 of a pound per square foot was used for the beds. This chemical fertilizer was placed between the layer of vegetable earth and the top surface of fine mould.

Seeding was done on April 20, as follows:—

6 beds of Aurora, 1/7 ounce per 100 square feet, dry seed.
2 beds Connecticut Broad Leaf 1/7 ounce per 100 square feet, dry seed.
2 beds Connecticut Seed Leaf, 1/7 ounce per 100 square feet, dry seed.
1 sash Belgian Tobacco, 1/7 ounce per 100 square feet, dry seed.
1 sash "Feuille d'Or," 1/7 ounce per 100 square feet, dry seed.

On April 29 the seedlings were up on all the beds; on May 7 they had taken four leaves.

On May 28 the preparation of the soil for the transplanting was completed; a chemical fertilizer was then spread. The following quantities were employed per arpent:—

250 pounds Sulphate of Ammonia.
150 pounds Sulphate of Potash.
80 pounds Superphosphate.

Before being ploughed in the fall, the field on which tobacco was to be planted had received an application of about 15 tons of farmyard manure to the arpent.

TRANSPLANTING.

The first variety to be transplanted was the Aurora on the 7th of June. On the 18th the transplanting was completed. It included the following:—

Aurora, 2 arpents.
Connecticut Broad Leaf, ½ arpent.
Connecticut Seed Leaf, ½ arpent.

A great many seedlings had to be replaced owing to cutworms and bad weather. About fifty per cent of the crop had to be reset in three operations. Hoeing and cultivating took up most of the time later on. On June 24 a violent storm caused a great deal of damage. On the 22nd of July a hail storm lasting ten minutes destroyed about 15 per cent of the crop.

On August 6 the plants were topped. Three suckerings were made. On the 26th cutting was started, beginning with the Aurora. On the 15th of September the whole

of the crop was in the curing barn. Owing to poor atmospheric conditions (damp and cold weather) it was necessary to make fires in the curing house. On the 10th of November curing was completed. If the tobacco had been supple. stripping might have been commenced at once, but this work could not be started before the 25th of November.

Yields of varieties by grade are given in the following table:—

Varieties.	Top leaves.	Median leaves.	Bottom leaves.	Refuse	Total.
	lb.	lb.	lb.	lb.	lb.
Aurora	237	489	245	20	901
Connecticut Broad Leaf	80	230	77	19	496
Connecticut Seed Leaf	116	260	84	18	478
Belgian	19	36			55
			Grand total		1930

SUPPLEMENTARY CROPS.

In addition to the tobacco plantation, three arpents were sown to barley and three arpents in clover, as usual. The seeding took place on May 29, 15 pounds of clover and $1\frac{3}{4}$ bushels of barley being sown per arpent.

The crops of barley and the crop of clover hay of 1914 were sold standing.

With the exception of the clover field that will be cropped in 1916, the whole Farm was ploughed in the fall.

The three arpents set aside for the plantation in 1916 received, on the 13th of October, two carloads of manure, which was buried by ploughing 8 inches deep.

ST-JACQUES.

EXPERIMENTAL TOBACCO STATION, HARROW, ONT.

REPORT OF THE MANAGER, G. C. ROUTT, B.S.A., M.S.

Before beginning the work as planned for the season, the Farm was divided into fields and plots in order that the 4-year rotation might be followed with more ease. A road running lengthwise through the centre of the Farm and three cross-roads divide it into 8 equal fields, each of which consists of 4 plots, making 32 plots in the Farm. The rotation consists of tobacco, corn, cereal and grass to be grown in the order in which they are named.

SEED-BEDS.

New frames for the seed-beds were completed early in April, and the work of preparing the seed-beds was begun immediately. A site in the orchard having a south-eastern exposure was chosen for the beds. All trees on this plot were removed. Eight beds were prepared, seven of which were covered with glass sashes, one with canvas. These beds were treated in the following way:—

Plant Bed No. 1—
Canvas covered bed, size 70 feet by 5½ feet.
Section No. 1. Cold-bed sown to Burley Harrow Station seed (1912) May 4.
" No. 2. Hot-bed. .. ..
" No. 3. Semi-hot. .. .. } Sown to Johnson's selections and hybrids, April 19.
" No. 4. Cold-bed .. ..
No fine mould distributed on section 4.
Fine mould distributed on sections 1, 2, 3.

Plant Bed No. 2—
Glass covered bed. Size, 60 feet by 6 feet.
Section No. 1. Hot-bed. Sown to Burley.
Harrow Station seed (1908) April 19.
Section No. 2. Semi-hot. Sown to Burley.
Harrow Station seed (1910). April 19.
Section No. 3. Cold-bed. Sown to Burley.
Harrow Station seed (1914).
No plant bed fertilizer distributed.

Plant Bed No. 3.—Semi-hot.
Glass covered bed. Size 66 feet by 6 feet.
Two feet of bed left unsteamed. Sown to Burley variety seed and Harrow Station seed.
18 feet of bed tramped hard after sowing.
No plant bed fertilizer distributed.

Plant Bed No. 4.—Semi-hot.
Glass covered bed. Size 70 feet by 6 feet.
Section No. 1. No plant bed fertilizer distributed.
Section No. 2. Plant bed fertilizer distributed before steaming. Whole bed sown to flue varieties except four sashes which were sown to Burley. Harrow Station seed (1910) April 19.

Plant Bed No. 5.—Semi-hot.
Glass covered. Size, 70 feet by 6 feet.
Sown to Warne and Hester, April 19.
Section No. 1. No plant bed fertilizer distributed.
Section No. 2. Plant bed fertilizer distributed after steaming.
Section No. 3. Plant bed fertilizer distributed before steaming.

Plant Bed No. 6.—Semi-hot.
Glass covered. Size, 66 feet by 6 feet.
Sown to Yellow Pryor and Warne, April 17.
Section No. 1. No plant bed fertilizer distributed.
Section No. 2. Plant bed fertilizer distributed after steaming.
Section No. 3. Plant bed fertilizer distributed before steaming.

Plant Bed No. 7.—Semi-hot.
Glass covered. Size, 70 feet by 6 feet.
Sown to Warne, April 17.
Plant bed fertilizer distributed before steaming.

Plant Bed No. 8.—Cold-bed.
Glass covered. Size, 50 feet by 6 feet.
Sown to Harrow Station Burley, April 17.
Plant bed fertilizer distributed after steaming.

The beds were steamed April 14 to 16.

Live steam at a pressure of 100 pounds was allowed to run into the pan 30 minutes before it was cut off and the pan was left on the bed 25 minutes longer. The frames were placed around each bed as soon as it was steamed. The seed was sown April 17 and 19 at the rate of ⅓ an ounce per 100 square feet. Only dry seed which was mixed with wood ashes was sown. The top surface of the beds was compacted either with a hand board or by tramping, after which they were given a light spray of water.

A good percentage of the seed had germinated by May 1 and grew quite rapidly until about May 10, when growth seemed to have been checked by cool weather. On May 17 the plants began to turn yellow. On examination the roots were found to be black. Beds No. 6, 7, and 8 were the most affected but the condition prevailed in all beds to a certain degree. A 1 per cent solution of ammonium sulphate was used in watering the beds. A great number of plants died and the beds presented quite a spotted appearance. After the weather became more favourable the plants recovered. By June 3 they were large enough for transplanting and the flue variety test plot was transplanted on this date.

The plants were drawn from bed No. 4 and there was apparently less disease in this than in any other bed in the lot.

Transplanting of the general crop of flue tobacco was begun June 5 on plots 3 and 4. The plants were drawn from beds No. 5 and 6. Plots No. 7, 14, 19 and 20 were transplanted to the flue varieties Warne and Hester, care being taken to draw plants from the healthiest part of the beds. Transplanting of the flue tobacco was completed June 12.

Transplanting of Burley was begun June 8 on plots 24 and 28. The plants were drawn from beds No. 2 and 8. Burley plots 23 and 27 were transplanted June 9 and 10. Burley fertilizer plots were transplanted June 15. Although the plants were apparently healthy at the time of transplanting the disease was noticeable in the Burley plots 23, 24 and 27 during the early part of July. The flue varieties were more resistant to root rot but the disease was detected in the field about the same time.

Plots 3, 4, 19, and 20 of the flue tobacco and plots 23, 24 and 27 of the Burley, showed the greatest number of diseased plants. These were the first transplanted and with the best and healthiest plants. This is fairly conclusive proof that the disease must have been present in the plots previous to transplanting. Plots 14 and 29 which were transplanted last and with the poorest lot of plants, showed the disease the least. These plots were on land that had grown tobacco only one year recently, and there was probably little if any disease in the soil. The extremely wet season was undoubtedly the cause of the unusual prevalence of the root rot disease.

CONCLUSION ON SEED-BEDS.

On beds where plant fertilizer was distributed, especially before steaming, the best results were obtained. The disease occurred to a certain extent in all beds but was more prevalent where the greatest amount of fine mould, which came from bush soil, was used most abundantly.

The greatest harm from the disease occurred during the cool unfavourable weather from May 17 to 28. A slight difference in favour of the semi-hot-beds could be noticed, due probably to better aeration and drainage.

The Turkish varieties and hybrids seemed less affected by the disease in the beds. In fact all flue varieties showed less disease than the White Burley varieties.

VARIETY TESTS.

The general crop of Burley of 6 acres was transplanted to plants grown from the Harrow Station seed of 1908, '10, '12, '14.. The Burley variety test plots which composed about one acre were transplanted to plants from Hope's Stand Up, Ky. seed,

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1914, Station Stand Up seed of Ky. Station, 1914, Broad Leaf Stand Up Ky. Station seed 1914, Dr. Halley's Burley, Ky. Station seed, 1914, and Trapp's Improved Burley, Virginia seed, 1913.

The general crop of flue tobacco was transplanted to Warne, Harrow Station seed 1909 and 1914, Yellow Pryor, Harrow Station seed 1914, and Hester, United States Department of Agriculture seed 1912.

The variety test plot of 1 acre was transplanted to Yellow Oronoco, Erzegovine Giant (A-1) and (30-1) C.E.F. seed 1914, Virginia Erzegovine (35-6) and (37-6) C.E.F. seed 1914, Virginia x Erzegovine x Virginia C.E.F. seed 1914, and Stolak (12-1) C.E.F. seed 1914.

The following hybrids were also transplanted: Warne x White Burley, White Burley x Warne, Erzegovine Stolak x White Burley, White Burley x Erzegovine Stolak, White Stem Oronoco x Erzegovine Stolak.

All varieties and hybrids on the test plot grew very large and rank and the results after curing in kilns were poor. There were a few plants, however, which gave a fair colour when cured.

BURLEY Fertilizer Plots.—One-tenth acre.

Number Plot.	Fertilizers.	Yield.	P.c. Stand.	Yield based on 100 p.c. Stand.	Yield per acre.
		lb.		lb.	lb.
1	Sulphate of Ammonia..... 24 " Potash..... 30 Superphosphate..... 20 Total..... 74	Trash.... 27 Lugs..... 46 Red..... 37 Tips..... 4 Total....114	87	131	1,310
2	Sulphate of Ammonia..... 32 " Potash..... 30 Superphosphate..... 20 Total..... 82	Trash.... 26 Lugs..... 41 Red..... 35 Tips..... 9 Total....111	83	134	1,340
3	Sulphate of Ammonia..... 48 " Potash..... 30 Superphosphate..... 20 Total..... 98	Trash.... 25 Lugs..... 57 Red..... 51 Tips..... 6 Total....139	89	156·1	1,561
4	Sulphate of Ammonia..... 40 " Potash..... 18 Superphosphate..... 20 Total..... 78	Trash.... 27 Lugs..... 46 Red..... 45 Tips..... 14 Total....132	91	145	1,450

Eight loads of manure per acre.

HARROW.

BURLEY Fertilizer Plots.—One-tenth acre.

Number of Plot.	Fertilizers.		Yield.		P.c. Stand.	Yield based on 100 p.c. Stand.	Yield per acre.
		lb.		lb.		lb.	lb.
5	Sulphate of Ammonia	40	Trash	26	90	166·6	1,666
	" Potash	24	Lugs	61			
	Superphosphate	20	Red	51			
	Total	84	Tips	12			
			Total	150			
6	Sulphate of Ammonia	40	Trash	29	93	156	1,560
	" Potash	36	Lugs	61			
	Superphosphate	20	Red	44			
	Total	96	Tips	11			
			Total	145			
7	Sulphate of Ammonia	40	Trash	21	92	151	1,510
	" Potash	30	Lugs	65			
	Superphosphate	12	Red	60			
	Total	82	Tips	3			
			Total	149			
8	Sulphate of Ammonia	40	Trash	33	94	157·4	1,574
	" Potash	30	Lugs	56			
	Superphosphate	16	Red	49			
	Total	86	Tips	10			
			Total	148			

Eight loads of manure per acre.

HARROW.

BURLEY Fertilizer Plots.—One-tenth acre.

Number of Plot.	Fertilizer.		Yield	P.c. Stand.	Yield based on 100 p.c. Stand	Yield per acre.
		lb.	lb.		lb.	lb.
9	Sulphate of Ammonia	40	Trash. . 27	93	164·5	1,645
	" Potash	30	Lugs..... 62			
	Superphosphate	24	Red..... 52			
	Total	94	Tips..... 12			
			Total....153			
10	Sulphate of Ammonia	24	Trash.... 23	95	148·4	1,484
	" Potash	18	Lugs..... 61			
	Superphosphate	12	Red..... 51			
	Total	54	Tips..... 6			
			Total....141			
11	Sulphate of Ammonia	32	Trash.... 26	92	144·5	1,445
	" Potash	24	Lugs..... 52			
	Superphosphate	16	Red..... 55			
	Total	72	Tips..... 0			
			Total....133			
12	Sulphate of Ammonia	40	Trash.... 22	96	167	1,670
	" Potash	30	Lugs..... 78			
	Superphosphate	20	Red ... 60			
	Total	90	Tips..... 0			
			Total....160			

Eight loads of manure per acre.

HARROW.

BURLEY Fertilizer Plots.—One-tenth acre.

Number Plot.	Fertilizer.	Yield.		P.c. Stand.	Yield based on 100 p.c. Stand.	Yield per acre.
		lb.	lb.		lb.	lb.
13	Sulphate of Ammonia	48	Trash 25	94	147	1,470
	" Potash	36	Lugs 57			
	Superphosphate	24	Red 54			
	Total	108	Tips 2			
			Total 138			
14	Sulphate of Ammonia	65	Trash 40	95	180	1,800
	" Potash	60	Lugs 48			
	Superphosphate	55	Red 75			
	Total	180	Tips 8			
			Total 171			
15	Check Plot		Trash 33	93	110·7	1,107
			Lugs 40			
			Red 25			
			Tips 5			
			Total 103			

Eight loads of manure per acre.

CONCLUSIONS OF BURLEY FERTILIZER EXPERIMENTS.

Each of the 15 plots was 130 feet by 33½ feet. They were laid off and the fertilizer applied broadcast by hand June 14. It was thoroughly worked into the soil with the disc harrow and the surface levelled with the drag harrow. No space was left between the plots. The tobacco was transplanted by machine June 15 on all the plots in the same way, the rows running crosswise of the plots. All plots were cultivated in the same manner and at the same time.

SULPHATE OF AMMONIA PLOTS.

On plots 1 to 3 the Sulphate of Ammonia was the only ingredient which varied in amount of application to each plot. The amount of Potassium Sulphate and Superphosphate was constant. The percentage of stand on 1 and especially 2 was lower than plot 3 due to a depression at the end of these plots. Plot 3 gave the best yield.

SULPHATE OF POTASSIUM PLOTS.

On plots 4 to 6 inclusive the Sulphate of Potassium was the only ingredient which varied. Plot 6 contained the largest amount of Sulphate of Potassium but plot 5 gave the highest yield.

SUPERPHOSPHATE PLOTS.

On plots 7 to 9 inclusive the Superphosphate was the only ingredient which varied. Plot 9 gave the highest yield—plot 8 the lowest.

GENERAL FORMULA PLOTS.

On plots 10 to 14 inclusive there was an increased amount of all the ingredients added. Plot 14 which received the largest amount of all the ingredients gave the highest yield but the yield in the other plots was quite variable. Plot 12, although considered as a General Formula plot could have been included under the Sulphate of

Potassium, Sulphate of Ammonia or Superphosphate plots since the amounts of the ingredients applied on this plot fit in between 2 and 3 in each of these 3 series.

Plot 15 received no commercial fertilizer and the yield was much lower than in any of the other plots.

On account of the variable yields on the different plots it is impossible to draw any conclusions in regard to the requirements of any special element of fertility, but, since the largest amount of fertilizer gave the highest yield and the check plot the lowest one can readily conclude that a rather abundant application of fertilizer is essential for the highest yields on this soil.

The Burley fertilizer plots were located on farm plot No. 29 and numbered from 1 to 15. These numbers should not be confused with the numbers of the farm plots which are used further on in the report under the heading of manure and fertilizer experiments.

General formula plot 12 if inserted between Ammonium Sulphate plots 2 and 3 will fill out the apparent skip from 32 to 48 pounds of this compound. The same is true in regard to the Potassium Sulphate and Superphosphate if it be inserted between plots 5 and 6, also plots 8 and 9 respectively.

MANURE AND FERTILIZER PLOTS.

Manure at the rate of 12 spreader loads per acre was applied to all the Burley land except the fertilizer plots, which received 8 loads. No manure was applied to the flue tobacco land. Manure was applied to corn plots 2, 12, 18, 31, and 32, at the rate of 8 loads per acre. Manure was also applied to cereal plots 1, 11, 16, 17 and 30 at the rate of 6 loads per acre.

Commercial fertilizer was applied to the bright tobacco plots as follows:—

	Pounds.
Plot 3—1·4 acres.	
Ammonium sulphate	75
Potassium sulphate	150
Acid phosphate	450
	675
Fertilizer applied broadcast, May 28.	
Plot 4—1·4 acres.	
Ammonium sulphate	150
Potassium sulphate	225
Acid phosphate	750
	1,125
Fertilizer applied broadcast, May 31.	
Plot 7—1·5 acres.	
Ammonium sulphate	75
Acid phosphate	375
	450
Fertilizer applied broadcast June 1.	
Plot 10—1 acre variety test plot.	
Potassium sulphate	50
Acid phosphate	300
	350
Fertilizer applied broadcast June 1.	
Plot 14—1·5 acres.	
Potassium sulphate	187½
Acid phosphate	412½
	600
Fertilizer applied broadcast June 7.	
Plot 19—¾ acre.	
Acid phosphate	400
Fertilizer applied broadcast May 31.	
Plot 20—½ acre.	
Potassium sulphate	100
Fertilizer applied broadcast May 31.	

Ammonium sulphate 200 pounds was applied to 12 rows of plot 19 July 21. This plot was very badly diseased at the time and the Ammonium Sulphate was applied to see what effect it would have on checking the root rot disease. The plants in these rows made a better growth after the application than did those in the untreated portion.

Ammonium sulphate 400 pounds was applied to 15 rows of Burley, plot 23, July 1. This plot was also badly diseased but the ammonium sulphate failed to give any results.

The manure and fertilizer plots which include the bright tobacco fertilizer experiments are designated by the numbers given to the plots of each field in the farm. This accounts for the variation in the size of the plots and the apparent skip in the number as most of these plots were in different fields. The same applies to the numbering of the plots devoted to corn and cereals.

CONCLUSIONS ON BRIGHT TOBACCO.

The variation of the fertilizers applied to the different bright tobacco plots was planned to test the relative fertility of the soil and to get a line on the relative effects of the different elements on time of maturity of the tobacco. Different varieties were transplanted on the same plot; they were also transplanted at different distances. These hindrances, together with the very unequal ripening of the tobacco which necessitated picking or spotting about the field, made it impossible to keep such a large amount separate after curing. For these reasons the yields of each plot are not given.

The tobacco on Plot 3 ripened earlier and more uniformly than on any of the other plots. It also cured with a better colour. In regard to the points referred to in plot 3 the tobacco on plot 4 probably ranked next to plot 3. The tobacco on plot 19 was very poor and a great many plants were too small to cut. The tobacco on plot 20 made a better growth and matured earlier than that on 19. On plots 10 and 14 the tobacco grew very coarse and ripened very slowly. The soil, however, on these two plots was more fertile and not so well adapted for bright tobacco. The root rot disease was not so prevalent as on the other plots, it being especially bad on plots 3, 7 and 19.

Taking everything into consideration plot 4 gave the best results and it would be safe to say that the best results with bright tobacco would be obtained when a liberal amount of commercial fertilizer is applied.

SELECTION AND BREEDING.

About 100 plants of each of 15 hybrids were transplanted both at the Tobacco Station and at the farm of Walker and Sons at Walkerville. They were the F 1. generation of White Burley x Connecticut Broad Leaf. Big Ohio, Comstock Spanish, both Walkerville and the Station Strain and their reciprocal crosses.

In most cases the plants possessed the dominant characteristics of the dark types both in regard to colour, leaf shape and arrangement on the stalk.

All plants made a fair growth at the Tobacco Station, also at Walkerville, which seemed to indicate either a greater resistance to the root-rot disease than White Burley, or a lack of infection in the soil. The plants at Walkerville were on the average somewhat larger than those at the Station; this was probably due to the difference in the type of soil since that at the former place was a very fertile gravelly loam, while at the latter it was sandy and less fertile.

SCAFFOLDING VERSUS DIRECT CURING.

About one-half of the Burley was cut and hung upon scaffolds in the field where it remained for different periods of time before being hung in the barn, viz. 4, 6, 9 and 14 days. The greater portion remained upon the scaffolds from 4 to 6 days and the

best results were obtained from this portion. The tobacco which remained upon the scaffolds for longer periods was of a more uneven colour, this probably being due to the excessive moisture with which the leaves came in contact while curing. This was more noticeable in the bottom or sand leaves which naturally cured more quickly because of their more ripened condition when the plants were cut.

The cool damp weather during practically the entire cutting period, was very unfavourable for scaffolding. There were few bright sunny days but instead a great deal of rain which interfered considerably with housing the tobacco. Tarpaulins were kept on the scaffolds during the night and the damp, cloudy days.

Practically no difference could be noticed in the time required for curing or in the colour of scaffolded and unscaffolded tobacco. There was ample barn space for hanging the sticks 10 to 12 inches apart in all cases, and for that reason there was less chance for injury from house burn which so often occurs from overcrowding in the barn.

When barn room is limited and weather conditions favourable there is an advantage in scaffolding for short periods provided the tobacco is handled carefully to prevent bruising.

FALL AND SPRING PLOUGHING.

One acre of ground was manured and ploughed in the fall of 1914 for comparing the relative conservation of soil moisture and destruction of insect pests with spring ploughing.

On account of the excessive rainfall during the entire growing season no difference could be detected between the relative moisture content of the fall and spring ploughed ground. In regard to the control of insect pests, namely cutworms, there was a slight difference in favour of the fall ploughed ground.

However the damage encountered from the "root rot" disease was much more noticeable on the fall ploughed ground, the percentage of plants infected being very high. More than 75 per cent of the plants were diseased and at least 50 per cent were too small to cut.

THE CURING.

The cutting of bright tobacco was begun September 9. All tobacco was selected in the field and all the stalks were split with the exception of those for one kiln which were speared on the lath.

All of the kilns were repaired and ventilating systems installed in order better to control the heat and moisture conditions at the critical stages of the curing process.

The tobacco ripened slowly and the curing operations were not completed until October 14. Ten kilns were cured, five were good, three fair and two very poor.

In the kilns which were cured first, the tobacco appeared somewhat unripe at the time of curing, but ran a better colour when placed in the bulk. The cold and rather high winds during the latter part of the curing season were very unfavourable and made it hard to control the temperatures of the kilns.

GRADING.

All of the tobacco was graded into 5 grades, as soon as pulled off the stalks, and tied into medium sized hands. The Burley was put into 5 grades as follows: Trash, lugs, long red (leaf), short red, and tips. The flue cured tobacco was also put into 5 grades as follows: Trash, bright No. 1, bright No. 2, red, green and black.

TOBACCO SEED.

On account of the prevalence of the "root rot" disease and the slow maturity of the tobacco the number of seed plants saved was somewhat reduced. About 100 seed heads of White Burley were saved, the majority of which were the Broad Leaf varieties which had been grown at the Station the past five years. A few seed heads of the Kentucky varieties which were introduced the same year were also saved. The varieties were Hope's Stand Up, Station Stand Up, Broad Leaf Stand Up, Improved Burley, J. P. Trapp (Virginia seed) and Dr. Halley's Burley. Seed from the following flue varieties were also saved: Hester, Yellow Pryor, Yellow Oronoco. Seed from the following Italian varieties and hybrids was also saved, Stolak (12-1) Virginia Erzegovine (36-6) Virginia Erzegovine (37-6) Virginia Erzegovine Virginia.

DIFFERENT DISTANCES OF TRANSPLANTING.

Both Burley and the flue cured types were transplanted at different distances in the row. The majority of the Burley was transplanted at a distance of 26 inches in rows 3 feet 8 inches apart. On plot 23, 4 rows each were transplanted at the following distances:

4 rows 3 feet 8 inches apart at 36 inches in row.
4 " " " " " 28 " "
4 " " " " " 21 " "
4 " " " " " 18 " "

This experiment was so badly broken into by the "root rot" disease that the results were discarded.

The greater portion of the flue tobacco was transplanted at the distances of 21, 24 and 26 inches. in rows 3 feet 2 inches apart. A small portion was transplanted at 18 inches, also about the same amount 24 inches in rows 3 feet 4 inches apart.

SPLIT VERSUS UNSPLIT STALKS.

Practically four-fifths of the stalks of the Burley were split when cut while the remaining one-fifth were cut and needled on the laths. Very little difference was noticeable in respect to the colour, but where the stalks were split the tobacco cured out sufficiently for stripping two weeks earlier than where the stalks were unsplit. In the latter case the stalks remained rather green and sappy for a much longer period than those split also the part of the midribs of the leaves nearest the stalks and especially the tip leaves remained quite spongy and wet for a long period where the stalks were unsplit.

All the stalks with the exception of one kiln were split in the flue tobacco. It required about 24 hours longer to cure this kiln, and, too, this was the only tobacco which moulded after being removed to the bulk.

SELECTION OF DISEASE RESISTING PLANTS.

This work, in charge of Prof. James Johnson, was conducted with about 75 plants, each of some 25 strains or selections of Burley and dark types of tobacco.

The plot of ground, about one-third of an acre, was apparently not very badly diseased and practically all of the selection made a fair yield. While some of the selections were a rather poor type of Burley, the greater portion cured out with a good colour.

HARROW.

ACID FERTILIZER EXPERIMENTS.

The experiments planned as a means of controlling the root rot disease were postponed on account of the flooding of the plots with liquid manure. These plots were located at the Walker and Sons farm and the work was to have been carried on in co-operation with Mr. Biggar.

ARTIFICIAL HEAT IN CURING BURLEY.

Charcoal was used in curing the tobacco from the Burley fertilizer plots 1 to 13, which were housed in the small barn. The fires were started October 9, ten days after it was hung in the barn. A temperature of between 70 degrees and 75 degrees Fahrenheit was maintained until all the leaf except the butts of the stems was cured. The firing was discontinued for a few days until the tobacco came in case when it was renewed until the stems and stalks were cured or dried out. The colour of the leaf was somewhat uneven but the percentage of lugs was increased. One and one-quarter tons of charcoal were used which cost $25. Burners made especially for the use of charcoal were employed.

DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE
DOMINION EXPERIMENTAL FARMS

REPORT

FROM THE

DIVISION OF ILLUSTRATION STATIONS

FOR THE

FISCAL YEAR ENDING MARCH 31, 1916

PREPARED BY

THE SUPERVISOR OF ILLUSTRATION STATIONS - - - JOHN FIXTER

DIVISION OF ILLUSTRATION STATIONS.

CENTRAL EXPERIMENTAL FARM,
OTTAWA, March 31, 1916.

The Director,
Dominion Experimental Farms,
Ottawa, Ont.

SIR,—I have the honour to submit, herewith, the report of the Division of Illustration Stations for the year ending March 31, 1916.

In accordance with instructions received from you I visited the provinces of Alberta, Saskatchewan, and Quebec, and selected farms for illustration work.

During the month of April, 1915, Illustration Stations were established at the following places:—

In Saskatchewan.—Assiniboia, Cabri, Gull Lake, Herbert, Kindersley, Maple Creek, Pambrum, Prelate and Shaunavon.

In Alberta.—Bow Island, Carmangay, Empress, Foremost, Grassy Lake, Jenner, Macleod, Magrath, Manyberries, Medicine Hat, Milk River, Pincher Creek, and Whitla.

In July further Illustration Stations were established at the following places:—

In Saskatchewan.—Biggar, Lloydminster, Moosejaw, Radville and Weyburn.

In Alberta.—High River and Munson.

Operations on the farms established during the month of July are to begin in 1916.

During the months of September and October the following Illustration Stations were established in the province of Quebec, operations to commence in 1916: Aubrey, Drummondville, Lac à la Tortue, Paspebiac West (New Carlisle), Rimouski, Stanbridge East, St. Gédéon, St. Julie (Verchères county), and Nominingue.

During the year Mr. J. F. Irwin was appointed assistant to supervise the work on the western Illustration Stations. Mr. Irwin being a graduate of the Manitoba Agricultural College and a practical farmer is admirably fitted for the work.

MEETINGS.

Addresses were given at the following places in Ontario: Elmira, Berlin, Floradale, Essex, Kingsville, and Perth; in Quebec: Lennoxville, and Ayerscliffe.

Meetings in connection with illustration work were held in the province of Saskatchewan at Herbert, Cabri, Prelate, and Maple Creek and in the province of Alberta at Bow Island, Grassy Lake, Carmangay, Magrath, and Pincher Creek.

Much credit is due for the success of the meetings in the western provinces to Mr. J. F. Irwin, Mr. M. J. Tinline, and Mr. W. H. Fairfield.

ACKNOWLEDGMENTS.

I desire to acknowledge the assistance rendered the Division of Illustration Stations by Mr. Angus Mackay, Mr. W. H. Fairfield, Mr. M. J. Tinline, Mr. W. H. Gibson, Mr. G. H. Hutton, Mr. P. H. Moore, Mr. W. C. McKillican, Mr. J. A. McClary, Mr. G. A. Langelier and Mr. Jos. Begin. Much credit is especially due my assistant, Mr. Irwin, who has been untiring in his efforts to make the Illustration Stations a success.

VISITS.

In Ontario I visited the following places twice in connection with demonstration work inaugurated by the Commission of Conservation and taken over by this Division: Williamsburg, Perth, Brooklin, Simcoe, Galt, Elmira, Essex, and Kingsville.

I made two visits to each of the following places in Quebec: Aubrey, Drummondville, Lac à la Tortue, New Carlisle, Rimouski, St. Julie, Stanbridge East, Nominingue, St Gédéon, Joliette, Nicolet, St. Prosper, Chambly, and Sweetsburg, also the Experimental Stations at Lennoxville, Cap Rouge, and Ste. Anne de la Pocatière.

During the year the following places in Alberta were visited: Bow Island, Foremost, Grassy Lake and Jenner three times; Macleod, four; Magrath, four; Manyberries, twice; Medicine Hat, three; Milk River, twice; Pincher Creek, four; Whitla, three; Stettler, twice; and High River, Botha, Coronation, Alderside, Edmonton, Bassano, Munson, once each. I also visited the Experimental Stations at Lethbridge and Lacombe.

In the province of Saskatchewan I visited the following places: Assiniboia, once: Cabri, twice; Gull Lake, four times; Herbert, four times; Kindersley, once; Maple Creek, four times; Pambrum, three times; Prelate, twice; Shaunavon, three times; Moosejaw, four times; Weyburn, three times; Radville, twice; Biggar, Lloydminster, Conquest, and Macklin, once. I also visited the Experimental Farm at Indian Head and the Experimental Station at Scott.

I have the honour to be, sir,
Your obedient servant,

JOHN FIXTER,
Supervisor.

ILLUSTRATION STATIONS IN SASKATCHEWAN.

Assiniboia.—The farm at this point on which the illustration fields are located is owned and operated by Mr. Percy J. H. Warren, and is situated in the southeast quarter of section 24, township 8, range 1, west of the 3rd meridian, a half a mile from the town of Assiniboia, Sask.

The soil is a chocolate loam, fairly uniform and representative of a large area. Owing to flax being grown on the land selected in 1914, it was decided to summer-fallow the whole area in 1915 and thus prepare it for cropping in 1916. The charges for rent and cultivation in 1915 are to be charged against the crop in 1916.

Biggar.—The farm at this point on which the illustration fields are located is owned and operated by Dr. S. E. Shaw, and is situated in the southeast quarter of section 32, township 35, range 14, west of the 3rd meridian, at the junction of two well-travelled roads, and facing the Grand Trunk railway.

The soil is a fairly light sandy loam, quite representative of the district. It is well settled throughout this section.

Cabri.—The farm at this point on which the illustration fields are located is owned and operated by Mr. F. W. Abraham and is situated in the northeast quarter of section 19, township 19, range 18, west of the 3rd meridian, one mile from the town of Cabri, Saskatchewan.

The soil is a medium heavy clay loam, representative of a large area. The land was all summer-fallowed in 1914 and worked into excellent condition for the crop in 1915.

Gull Lake.—The farm at this point on which the illustration fields are located is owned and operated by Mr. E. H. Thomas and is situated in the southwest quarter of section 23, township 13, range 19, west of the 3rd meridian. This farm adjoins the town of Gull Lake, and can be seen from the main line of the Canadian Pacific railway.

The soil is a medium heavy, sandy loam and rather undulating. The whole area was cropped in 1914 and summer-fallowed with the exception of field "A" in 1915.

Herbert.—The farm at this point on which the illustration fields are located is owned and operated by Mr. Milton Holmes and is situated in the northwest quarter of section 18, township 17, range 9, west of the 3rd meridian, bordering a well-travelled road and one-half mile west of Herbert, Sask.

The soil is a chocolate loam, representative of a large area. The northern portion of the farm selected for illustration work was broken in 1914 and thoroughly prepared for seeding. The balance, prairie sod, was broken and worked during the season of 1915.

Kindersley.—The farm at this point on which the illustration fields are located is owned by the Ottawa Farm Development Company, and is operated by Halpenny Bros. for the company. It is situated in the northwest quarter of section 9, township 26, range 22, west of the 3rd meridian, adjoining a public road and quite close to the proposed Canadian Northern station.

The soil is a strong, clay loam with a clay subsoil, representative of a large area; the land was summer-fallowed in 1914 and cropped in 1915.

Lloydminster.—The farm at this point on which the illustration fields are located is owned and operated by Mr. Hugh Hill, and is situated in the southwest quarter of section 11, township 50, range 28, west of the 3rd meridian, one-half of a mile north of the town.

The soil is a dark loam, with clay and sand subsoil, representative of a very large district.

Maple Creek.—The farm at this point on which the illustration fields are located, is owned and operated by Mr. Geo. L. Hammond, and is situated in the southwest quarter of section 12, township 11, range 26, west of the 3rd meridian, one mile east of the town of Maple Creek, Saskatchewan.

The soil is a light clay loam with some sand, representative of a large area.

No crop was grown on the fields in 1914, which enabled the operator to prepare for cropping in 1915.

Moosejaw.—The farm at this point on which the illustration fields are located is owned and operated by Mr. John Glassford and is situated in the southeast quarter of section 12, township 17, range 27, west of the 2nd meridian, two miles west of the town of Moosejaw, and borders a well travelled road and can be seen from the railway.

The soil is a heavy loam, representative of the district.

Pambrum.—The farm at this point on which the illustration fields are located is owned and operated by Mr. C. W. Appelgren, and is situated in the north half of section 21, township 11, range 11, west of the 3rd meridian, a half mile south of the town of Pambrum.

The soil is a light clay loam, representative of a large area.

The selected fields have been cropped continuously since 1911, and in 1915 all were summer-fallowed with the exception of field "A" and half of "H."

Prelate.—The farm at this point on which the illustration fields are located is owned and operated by Mr. Wm. Huxtable, and is situated in the southwest quarter of section 15, township 22, range 25, west of the 3rd meridian, one mile north of the town of Prelate.

The soil is a strong, clay loam, representative of a large area.

The selected fields were broken from prairie sod in 1914 and thoroughly cultivated for cropping in 1915.

Radville.—The farm at this point on which the illustration fields are located is situated in the southeast quarter of section 18, township 6, range 17, west of the 2nd meridian, bordering the main highway and adjoining the town of Radville.

The soil is a very heavy loam, very much like subsoil. This land has apparently been burned over and most of the vegetable matter destroyed. This farm is owned by Mr. P. A. Stuart, and operated by Mr. Lewis Kroon.

Shaunavon.—The farm at this point on which the illustration fields are located is owned and operated by Mr. Neil McLean, and is situated in the northeast quarter of section 18, township 8, range 18, west of the 3rd meridian, adjoining the town of Shaunavon.

The soil is a medium chocolate loam representative of a large area.

The fields were in stubble in 1914 and were fall-ploughed. Four fields were sown in 1915, the balance summer-fallowed.

Weyburn.—The farm at this point on which the illustration fields are located, is owned by Mr. E. Meredith and is situated in the southeast quarter of section 6, township 9, range 14, west of the 2nd meridian, three miles north of the town on the junction of two well travelled roads.

The soil is a chocolate loam, representative of a large area.

ILLUSTRATION STATIONS IN ALBERTA.

Bow Island.--The farm at this point on which the illustration fields are located is owned and operated by Mr. M. Mortensen, and is situated in the northeast quarter of section 2, township 10, range 11, west of the 4th meridian. It is about four and a half miles south of the town and borders the main road.

The soil is a heavy sandy loam, with a tendency to clay or chocolate loam.

About three-fourths of the selection was broken in 1913 and cropped in 1914. In order to clean the land and break and backset the balance, it was decided to crop only field "A" (5 acres) in 1915.

Carmangay.—The farm at this point on which the illustration fields are located is owned and operated by Mr. J. A. Neilson, and is situated in the southwest quarter of section 14, range 23, township 14, west of the 4th meridian, two miles east of the town of Carmangay.

The soil is a sandy loam, representative of a large area.

The fields selected were broken in 1908, cropped four times, two summer-fallows, and in crop in 1914. The whole area was summer-fallowed in 1915, with the exception of field "A," and to be cropped as directed in 1916.

Empress.—The farm at this point on which the illustration fields are located is owned and operated by Mr. Frank Barry, and is situated in the northeast quarter of section 28, township 22, range 1, west of the 4th meridian, five and one-half miles south of the town of Empress.

The soil is a sandy loam, representative of a large area.

Five acres of the selection was broken in 1914 and cropped in 1915. The balance, 35 acres in prairie sod, is to be broken and prepared for cropping as directed in 1916.

Foremost.—The farm at this point on which the illustration fields are located is owned and operated by Mr. T. H. Frankish, and is situated in the southwest quarter of section 4, township 6, range 11, west of the 4th meridian. It borders a well-travelled road connecting Foremost and Avalon, and is about two miles from the town of Foremost.

The soil is a chocolate loam, representative of a very large area.

The prairie sod was broken in 1910, summer-fallowed in 1914, and fields A, B, E, F, G, and H were sown in 1915.

Grassy Lake.—The farm at this point on which the illustration fields are located is owned by Mr. F. N. Perry and is situated in the southeast quarter of section 15, township 10, range 13, west of the 4th meridian, adjoining the town of Grassy Lake.

The soil is a heavy, sandy loam, representative of a large area. It was broken from prairie sod in 1910 and has been cropped three seasons. On account of being cropped in 1914, only field "A" could be sown in 1915. The balance was summer-fallowed.

Jenner.—The farm at this point on which the illustration fields are located is owned and operated by Mr. Jerry Fisher, and is situated in the west half of section 2, township 21, range 9, west of the 4th meridian, one mile east of the town of Jenner, and bordering a well-travelled road.

The soil is a medium, clay loam with a hard, stiff subsoil, representative of a large area.

The area selected being in prairie sod had to be broken and prepared in 1915 for cropping as directed in 1916.

High River.—The farm at this point on which the illustration fields are located is owned and operated by Mr. B. F. Kiser, and is situated in the southeast quarter of section 5, township 19, range 28, west of the 4th meridian, adjoining the east side of the town.

The soil is a chocolate loam, representative of the district.

Macleod.—The farm at this point on which the illustration fields are located is owned and operated by Mr. Norman Grier, and is situated in section 33, township 9, range 26, west of the 4th meridian, about six miles from Macleod and bordering a well-travelled road leading to Calgary.

The soil is a medium, clay loam, representative of a large area. At time of selection the area was in prairie sod and had to be broken and backset for cropping in 1916.

Magrath.—The farm at this point on which the illustration fields are located is owned and operated by Mr. J. A. Meldrum, and is situated in the northeast quarter of section 11, township 5, range 22, west of the 4th meridian, three miles south of the town of Magrath.

The soil is a medium sandy loam, partly chocolate.

The area selected was broken in 1911, summer-fallowed in 1914 and fields A, B. E, F, G, and H sown in 1915. Fields C and D are to be sown in 1916.

Manyberries.—The farm at this point on which the illustration fields are located is owned and operated by Mr. Matti Mickelson, and is situated in the northeast quarter of section 25, township 5, range 6, west of the 4th meridian, one mile from Manyberries and about forty miles from Seven Persons railway station.

The soil is a medium clay loam, representative of a large area. The selected area was broken from prairie sod in 1913 but the crop failed in 1914. This land was thoroughly ploughed and worked early in the autumn of 1914 and several fields were made ready for cropping in 1915.

Medicine Hat.—The farm at this point on which the illustration fields are located is owned and operated by Mr. E. J. Hunt, and is situated in the east half of section 12, township 13, range 5, west of the 4th meridian, about six miles north of the town and bordering a well-travelled road.

The soil is a sandy loam, rather light in character, representative of a very large area.

The land was broken from prairie sod in 1910, but the crop failed in 1914 and the land was ploughed early in the autumn of 1914. Fields A, B, E, and F were sown in 1915 and the balance will be summer-fallowed and sown in 1916.

Milk River.—The farm at this point on which the illustration fields are located is owned and operated by Mr. Wm. Kinder, and is situated in the southwest quarter of section 30, township 2, range 15, west of the 4th meridian, three and a half miles east of the town of Milk River.

The soil is a medium heavy clay loam and very undulating with considerable stone.

At the time of selection the area was in prairie sod and no crop was grown during the season of 1915, but all fields were prepared for cropping in 1916, as directed.

Munson.—The farm at this point on which the illustration fields are located is owned and operated by Mr. R. R. Fraser, and is situated in the northeast quarter of section 3, township 30, range 20, west of the 4th meridian, two miles southeast of the town. It is on a well travelled road and can be seen from the town.

The soil is a heavy clay loam, representative of a large area.

Pincher Creek.—The farm at this point on which the illustration fields are located is owned and operated by Messrs. Sandgren & Carlson, and is situated in section 15, township 6, range 20, west of the 4th meridian, two miles west of the town of Pincher Creek.

The soil is a medium clay loam, representative of a large area. The land chosen was cropped in 1914. It was decided to summer-fallow the whole area in 1915, to be cropped as directed in 1916.

Whitla.—The farm at this point on which the illustration fields are located is owned and operated by Mr. R. H. Babe, and is situated in section 8, township 11, range 8, west of the 4th meridian, adjacent to the town of Whitla.

The soil is a medium heavy clay loam with a very undulating surface. At the time of its selection for illustration purposes the soil was in prairie sod, there being no crop grown in 1915.

WEATHER CONDITIONS.

In the provinces of Alberta and Saskatchewan, heavy rains prevailed during the months of August, September, and October, 1914, and the abundant snow fall during the winter, along the heavy rains in May, June, and July, 1915, made conditions most favourable for successful crops of cereals and forage.

WEATHER Observations taken at the following Illustration Stations:—

ASSINIBOIA, SASK.

Month.	Temperature.		Rainfall.		Snowfall.	
	Highest.	Lowest.	Inches.	Hours.	Inches.	Hours.
	°	°				
June	85	34·5	1·54	10¾		
July	85	39·5	3·81	17¾		
August	92	39	0·21	3		
September	90	25	1·73	16	2·0	25
October	75	20	0·35	7¼		
November	61	— 2	0·18	4½		
December	52	—20	0·16	2	9·0	3
January	23	—47	·03	5	6·0	38½
February	45	—15	·03	1	4·0	8
March	48	—15	.....	.....	16·0	27

CABRI, SASK.

May	83	26	3·75	68		
June	80	33	6·12	64·3		
July	84	40	2·59	26		
August	94	39	0·28	2		
September	83	26	2·15	28		
October	78	22	0·68	20		
November	59	0				
December	54	—13	·0	.....	2·5	10
January	25	—26	·0	.....	9·75	39
February	45	—48	0·15	3	3·5	22
March	45	—22	0·47	13½		

GULL LAKE, SASK.

May	71	44	.....	Only 2 days reported.		
June	80	30	3·34	35½		
July	82	32	2·33	42		
August	95	32	0·38	7		
September	85	21	1·67	13		

WEATHER Observations taken at the following Illustration Stations:—*Continued.*

KINDERSLEY, SASK.

Month.	Temperature.		Rainfall.		Snowfall.	
	Highest.	Lowest.	Inches.	Hours.	Inches.	Hours.
	°					
May	76·5	22·2	3·12	65½		
June	76·1	30	3·62	40		
July	80·5	34	1·33			
August	92	36	0·84	4		
September	79·2	22·8	1·66	14½	0·25	
October	68·8	17	0·27	5½		
November	51·5	— 3·8	0·10	2		
December	42·7	—17·2			2·0	6
January	18	—49·2			4·5	73
February	41·5	—31·2			1·5	15
March	40	—31			3·0	31

SHAUNAVON, SASK.

June	83	31	4·26	40		
July	89	35	4·69	7		
August	90	36	0·22	½		
September	82	22	1·42			
October	76	19	0·94			
November	58	— 4				
December	55	—11				
January	21	—47				
February	50	—28				
March	49	—28	0·64			

MANYBERRIES, ALTA.

June	84	44	2·75	1		
July	82	38	5·34	41	5·34	
August	90	40	0·52	1		
September	83	25	0·02	5		
October	74	30				
November	64	— 0				
December	45	—15				
January	52	—30				

MILK RIVER, ALTA.

June	85	40	2·95	43		
July	90	40	3·74	26½		
August	92	43	0·46	3		
September	77	21	1·44	9		
October	73	24	1·23	39		
November	64	— 4				
December	48	—10			6·0	16
January	26	—26			4·0	
February	52	—27			12·0	
March	62	—11			7·0	11

WHITLA, ALTA.

May	79	39				
June	86	37	3·0	9		
July	87	43	4·37	29		
August	94	46				
September	82	23	2·60	9		
October	74	21	·99	30		
November	63	2			2·0	

COST VALUES.

The following fixed values are being used on all Illustration Stations:—

Manual labour	per hour.	$0 20
Horse labour (including teamster)—		
Single horse	"	27
Two-horse team	"	34
Three-horse team	"	41
Four-horse team	"	48
Additional horse each	"	7
Rent of land	per acre.	2 00
Machinery (not including threshing)	"	60
Seed wheat	per bushel.	1 25
" oats	"	75
" barley	"	1 25
" corn	at cost.	

Grass and clover seed charged at cost, total cost to be distributed over the number of years to be in hay or pasture.

Twine charged at cost.

Threshing, including hauling from the stook and delivering grain in granary, at cost.

In parts of Alberta and Saskatchewan wheat is the most important of the grain crops, although oats, barley, and flax are being extensively grown. Cereal farming on virgin soil gives profitable returns for a few years, particularly with those who practise summer-fallowing at intervals. There are, however, but few farmers who practise a systematic rotation, including hoed crops, grass and forage crops, legumes and cereals.

To illustrate, if possible, a suitable rotation to a certain district, the following rotations have been adopted, with details tabulated of the work of 1915:—

CROPPING SYSTEM ON ILLUSTRATION AREA.

Field.	First Year.	Second Year.	Third Year.
A	Wheat continuously		
B	Two-year rotation, wheat	Fallow	
C	Fallow	Wheat	
D	Fallow	3-year rotation, wheat	Oats.
E	Wheat	Oats	Fallow.
F	Oats	Fallow	Wheat.
G	Alfalfa, 2 acres, in rows 36 inches apart		
	1 acre, broadcast		
	Western rye grass, 2 acres		
H	Corn, 2½ acres, in rows 36 inches apart		
	Wheat, 2½ acres		

Field A. (5 acres). Rotation one year, wheat continuously.

The object of this rotation is to ascertain how long wheat can be grown profitably on the same soil with good average cultivation, and also to be used as a comparison with the more extensive cultivated fields.

Illustration Station Crop Records.—Field A. Description of Rotation: 1st year, wheat continuously; 2nd year; 3rd year.

Province and Post Office.	Area.	Rent of Land.	Date of Sowing.		Amount of Seed sown per acre.	Date of Harvesting.		Items of Expense in Raising Crops.														Cost for one acre.	Cost for one bushel.	Cost for one ton.	Yield per acre—Grain.	Yield per acre—Hay.	Yield per acre—Hoed Crops.	Kind of Crop and Cultivation.
								Seed, Twine and Use of Machinery.	Manual Labour.		Horse Labour (including teamster). Hours.								Value of Horse Labour.	Cost of Threshing.	Total Cost.							
			Month.	Date.		Month.	Date.		Hours.	Cost.	Single Horse.	Two Horses.	Three Horses.	Four Horses.	Five Horses.	Six Horses.	Seven Horses.	Eight Horses.										
Saskatchewan.	Ac.	$ cts			Lbs			$ cts.	No.	$ cts.	No.	No.	No.	No	No.	No.	No.	No.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$cts	Bush			
Assiniboia	5	10 00						3 00						10¾		24			20 04		33 04	6 60						Summer fallow.
Cabri	5	10 00	April	16	1¼	Aug.	20	12 79	6	1 20				63					30 24	22 05	76 28	15 26	0 31		49			Marquis Wheat.
Gull Lake	5	10 00	April	14	1¼	Aug.	19	12 46	4	0 80				10		13			12 86	21 00	57 12	11 43	32¾		39			Marquis Wheat.
Herbert	2½	5 00	April	28	1¼	Aug.	20	6 39	3	0 60				27					12 96	9 87	34 82	13 93	35		39½			Marquis Wheat.
Herbert	2½	5 00						1 50						8½					4 08		10 58	4 23						Breaking and Cultivating.
Kindersley	5	10 00	May	3	1¼	Aug.	25	12 79	16½	3 30				23½	20				22 28	24 40	72 77	14 55	29⅔		48⅔			Marquis Wheat.
Maple Creek	5	10 00	April	17	1¼	"	25	12 79	7	1 40			4	10¾	16½				15 74	17 70	57 63	11 52	32⅓		35⅔			"
Pambrum	5	10 00	"	19	1¼	"	28	13 06	6	1 20				15½	12				14 04	14 10	52 40	10 48	37⅙		28⅔			"
Prelate	5	10 00	"	20	1	"	27	10 55	2½	0 50				9½	18				14 46	13 40	48 91	9 78	36½		26⅓			"
Shaunavon	5	10 00	"	21	1½	"	31	12 01	6	1 20				7					17 49	14 00	54 70	10 94	39		28			"
Alberta.																												
Bow Island	5	10 00	April	26	1¼	Aug.	20	12 73	5	1 00				50					24 00	10 00	57 73	11 55	57¾		20			Marquis Wheat.
Carmangay	5	10 00	"	26	1¾	Sept.	6	11 91	3	0 60		27½		12					15 11	14 30	51 92	10 38	40		26			"
Empress	5	10 00	"	19	1¼	Aug.	26	12 46	4	0 80				21		23			24 34	19 50	67 10	13 42	34½		39			"
Foremost	5	10 00			1¼			12 79	8	1 60				18		8			13 60	26 73	64 72	12 94	26		48⅖			"
Grassy Lake	5	10 00	April	26	1¼	Aug.	19	12 57	14	2 80				33½		14½			25 07	14 30	63 99	12 78	49⅕		26			"
Jenner	5	10 00						3 00						10⅓					19 36		32 36	6 47						"
Macleod	5	10 00						3 00						2		9		9	13 38		26 38	5 27						Breaking and Cultivating.
Magrath	5	10 00	April	16	1¼	Aug.	26	13 01	10	2 00			8	10			9		14 29	36 30	75 60	15 12	23		66			Marquis Wheat.
Manyberries	5	10 00	May	3	1	"	29	10 87	5	1 00				32					15 36	23 28	60 51	12 10	31⅕		38⅘			"
Medicine Hat	5	10 00	April	14	1¼	"	14	12 31	5	1 00				36½					17 52	20 00	60 83	12 17	30¼		40			"
Milk River	5	10 00						3 00						30¼	27½		12		36 27		49 27	9 85						Breaking and Cultivating.
Pincher Creek	5	10 00						3 00						13		22			19 88		32 88	6 57						Summer-fallow.
Whitla	5	10 00						3 00						43					20 64		33 64	6 72						Breaking and Cultivating.

FIELDS B and C (5 acres each). Two year rotation: First year, summer-fallow, second year, wheat.

In some sections where the soil is rich in humus this rotation is practised with good results. Summer-fallowing every alternate year conserves moisture, kills weeds and almost insures the succeeding crop. There is, however, a great danger in this rotation, as in time the soil will become deficient in humus.

ILLUSTRATION STATION CROP RECORDS.—Rotation 2 years. Field B. Description fallow, second year, wheat; third year, oats.

Province and Post Office.	Area.	Rent of Land.	Date of Sowing.		Amount of Seed sown per acre.	Date of Harvesting.		Items of Expense in Raising Crops.															Cost for one acre.	Cost for one bushel.	Cost for one ton.	Yield per acre—Grain.	Yield per acre—Hay.	Yield per acre—Hoed Crop.	Kind of Crop and Cultivation.
								Seed, Twine and Use of Machinery.	Manual Labour.		Horse Labour (including teamster). Hours.								Value of Horse Labour.	Cost of Threshing.	Total Cost.							
			Month.	Date.		Month.	Date.		Hours.	Cost.	Single Horse.	Two Horses.	Three Horses.	Four Horses.	Five Horses.	Six Horses.	Seven Horses.	Eight Horses.										
SASKATCHEWAN.	Ac.	$ cts.			Lbs			$ cts.	No.	$ sts.			No.	No	No.	No.	No.	No	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts	Bush.			
Assiniboia	5	10 00						3 00						10¾		24			20 04		33 04	6 61						Summer-fallow.
Cabri	5	10 00	April	15	1¼	Aug.	23	12 79	6	1 20				63					30 24	24 30	78 53	15 71	20		54			Marquis Wheat.
Gull Lake	5	10 00						3 00						11		13			13 34		26 34	5 26½						Summer-fallow.
Herbert	2½	5 00	April	28	1¼	Aug.	20	6 39	3	0 60				27					12 96	9 75	34 70	13 88	36		39			Marquis Wheat
Herbert	2½	5 00						1 50						21					10 08		16 58	6 63						Breaking and Cultivating.
Kindersley	5	10 00	May	3	1¼	Aug.	25	12 68	16	3 20				23½	20				22 28	23 60	71 76	14 35	30·32–4/10		47½			Marquis Wheat.
Maple Creek	5	10 00	April	17	1¼	Aug.	25	12 79	7	1 40			3¼	10½	16½				15 48	18 00	57 67	11 53			36			"
Pambrum	5	10 00						3 00						26	15½				20 87		33 87	6 77						Summer-fallow.
Prelate	5	10 00	April	20	1	Aug.	27	10 55	2½	0 50				10¾	18				15 06	13 20	49 31	9 86	37½		26⅔			Marquis Wheat.
Shaunavon	5	10 00	April	21	1¼	Aug.	31	12 01	6	1 20				37	7				18 53	15 00	56 74	11 35	37 8/10		30			"
ALBERTA.																												
Bow Island	5	10 00						3 00						25					12 00		25 00	5 00						Breaking and Cultivating.
Carmangay	5	10 00						3 00						6		16			12 80		25 80	5 16						Summer-fallowing.
Empress	5	10 00						3 00						7		45½			31 57		44 57	8 90						Breaking and Back setting.
Foremost	5	10 00	April	16	1¼	Aug.	26	12 79	8	2 00				18		8			13 60	24 53	62 92	12 59	28		44⅔			Marquis Wheat.
Grassy Lake	5	10 00						3 00						27½		14½			22 19		35 19	7 04						Summer-fallow.
Jenner	5	10 00						3 00						40½					19 44		32 44	6 49						Breaking and Cultivating.
Macleod	5	10 00						3 00						2		9		9	13 38		26 38	5 28						Breaking and Back setting.
Magrath	5	10 00	April	16	1¼	Aug.	26	13 34	12	2 40				18			9		14 85	31 57	72 16	14 43	25²/10		57⅔			Marquis Wheat.
Manyberries	5	10 00	May	3	1	"	29	10 87	5	1 00				32					15 36	22 20	59 43	11 89	32		37			"
Medicine Hat	5	10 00	April	15	1¼	Aug.	16	12 31	5	1 00				34					16 32	20 00	59 63	11 93	29⁹/10		40			Breaking and Cultivating.
Milk River	5	10 00						3 00							18½	28			24 28		37 28	7 46						Summer-fallow.
Pincher Creek	5	10 00						3 00						13		22			19 88		32 88	6 58						Breaking and Cultivating.
Whitla	5	10 00						3 00						43					20 64		33 64	6 73						

FIELDS B and C (5 acres each). Two-year Rotation. First year, Summer-fallow; Second year, Wheat.

In some sections where the soil is rich in humus this rotation is practised with good results. Summer-fallowing every alternate year conserves moisture, kills weeds and almost insures the succeeding crop. There is, however, a great danger in this rotation, as in time the soil will become deficient in humus.

ILLUSTRATION STATION CROP RECORDS.—Rotation 2 years. Field B. Description of Rotation: Summer-fallow, wheat.

Province and Post Office.	Area.	Rent of Land.	Date of Sowing.		Amount of Seed sown per acre	Date of Harvesting.		Items of Expense in Raising Crops.															Cost of one acre.	Cost of one bushel.	Cost of one ton.	Yield per acre—Grain.	Yield per acre—Hay.	Yield per acre—Hoed Crop.	Kind of Crop and Cultivation.
								Seed, Twine and Use of Machinery.	Manual Labour.		Horse Labour (including teamster). Hours.									Value of Horse Labour.	Cost of Threshing.	Total Cost.							
			Month.	Date.		Month.	Date.		Hours.	Cost.	Single Horse.	Two Horses.	Three Horses.	Four Horses.	Five Horses.	Six Horses.	Seven Horses.	Eight Horses.										
SASKATCHEWAN.	Ac.	$ cts.			Lbs			$ cts.	No.	$ cts.			No.	No.	No.	No.	No.	No.	$ cts	$ cts.	$ cts.	$ cts.	$ cts.	$ cts	Bush.			
Assiniboia	5	10 00						3 00						10¾		24			20 04		33 04	6 61						Summer-fallow.
Cabri	5	10 00						3 00						40½					19 44		32 44	6 49						"
Gull Lake	5	10 00						3 00						11		13			13 34		26 34	5 26½						"
Herbert	2½	5 00						1 50						27					12 96		19 46	7 78						
Herbert	2½	5 00						1 50						21					10 08		16 58	6 63						Breaking and Cultivating.
Kindersley	5	10 00						3 00						14	20				17 72		30 72	6 14						Summer-fallow.
Maple Creek	5	10 00						3 00						13⅔	16¼				15 24		28 24	5 65						"
Pambrum	5	10 00						3 00						26	15¼				20 87		33 87	6 77						"
Prelate	5	10 00						3 00						10	13½				12 22		25 22	5 04						"
Shaunavon	5	10 00						3 00					39						15 99		28 99	5 78						"
ALBERTA.																												
Bow Island	5	10 00						3 00						57					27 36		40 36	8 07						Breaking and Backsetting.
Carmangay	5	10 00						3 00						6		16			12 80		25 80	5 16						Summer-fallow.
Empress	5	10 00						3 00						6		23			17 14		30 14	6 03						Breaking and Cultivating.
Foremost	5	10 00						3 00								12			7 44		20 44	4 09						Summer-fallow.
Grassy Lake	5	10 00						3 00						23½		14½			20 27		33 27	6 65						"
Jenner	5	10 00						3 00						68½					32 80		45 80	9 16						Breaking and Backsetting.
Macleod	5	10 00						3 00						2					97 80		20 80	4 16						Breaking.
Magrath	5	10 00						3 00						12			16		16 80		29 80	5 96						Summer-fallow.
Manyberries	5	10 00						3 00						24					11 52		24 52	4 90						"
Medicine Hat	5	10 00						3 00						30½					14 64		27 64	5 53						"
Milk River	5	10 00						3 00						11	27½				20 30		33 30	6 66						"
Pincher Creek	5	10 00						3 00						13		22			19 88		32 88	6 57						"
Whitla	5	10 00						3 00						43					20 64		33 64	6 73						Breaking and Cultivating.

Fields D, E, and F (5 acres each). Three-year rotation: First year, summer-fallow; second year, wheat; third year, oats.

This rotation is practised by many farmers with fair results. There are, however, some instances where weeds increase so rapidly that increased tillage is necessary. There is also the danger of the soil becoming deficient in plant food.

Illustration Station Crop Records.—Field D.—Rotation Three Years.—Description of Rotation: 1st year, Summer-fallow; 2nd year, Wheat; 3rd year, Oats.

Province and Post Office.	Area.	Rent of Land.	Date of Sowing.		Amount of Seed sown per acre.	Date of Harvesting.		Items of Expense in Raising Crops.														Total Cost.	Cost of one acre.	Cost of one bushel.	Cost of one ton.	Yield per acre—Grain.	Yield per acre—Hay.	Yield per acre—Hoed Crop.	Kind of Crop and Cultivation.
								Seed, Twine and use of Machinery.	Manual Labour.		Horse Labour (including teamster).										Cost of Threshing.							
											Hours.																	
			Month.	Date.		Month.	Date.		Hours.	Cost.	Single Horse.	Two Horses.	Three Horses.	Four Horses.	Five Horses.	Six Horses.	Seven Horses.	Eight Horses.	Value of Horse Labour.								
Saskatchewan.	Ac.	$ cts.						$ cts.					No.	No	No.	No.	No.	No.	$ cts	$ cts.	$ cts.	$ cts.	$ cts.	$ cts				
Assiniboia	5	10 00						3 00						10¾		24			20 04		33 04	6 61						Summer-fallow.
Cabri	5	10 00						3 00						40½					19 44		32 44	6 49						"
Gull Lake	5	10 00						3 00						11		13			13 34		26 34	5 26⅗						"
Herbert	2½	5 00						1 50						27					12 96		19 46	7 78						
Herbert	2½	5 00						1 50						21					10 08		16 58	6 63						Breaking.
Kindersley	5	10 00						3 00						14	20				17 72		30 72	6 14						Summer-fallow.
Maple Creek	5	10 00						3 00						13	16¼				15 17		28 17	5 63						"
Pambrum	5	10 00						3 00						26	15¼				20 87		33 87	6 77						"
Prelate	5	10 00						3 00						9	13½				11 74		24 74	4 95						"
Shaunavon	5	10 00						3 00					39						15 99		28 99	5 80						"
Alberta.																												
Bow Island	5	10 00						3 00						52½					25 20		38 20	7 64						Breaking and Cultivating.
Carmangay	5	10 00						3 00						6		16			12 80		25 80	5 16						Summer-fallow.
Empress	5	10 00						3 00						6		23			17 14		30 14	6 04						Breaking and Cultivating.
Foremost	5	10 00						3 00								12			7 44		20 44	4 09						Summer-fallow.
Grassy Lake	5	10 00						3 00						23½		14½			20 27		33 27	9 65						"
Jenner	5	10 00						3 00						68¼					32 80		45 80	9 16						Breaking and Backsetting.
Macleod	5	10 00						3 00						2				9	7 80		20 80	4 16						Breaking and Backsetting.
Magrath	5	10 00						3 00						12			12		14 04		27 04	5 41						Summer-fallow.
Manyberries	5	10 00						3 00						26					12 48		25 48	5 10						"
Medicine Hat	5	10 00						3 00						30½					14 64		27 64	5 53						"
Milk River	5	10 00						3 00						15½	21				18 99		31 99	6 40						"
Pincher Creek	5	10 00						3 00						13		22			19 88		32 88	6 58						"
Whitla	5	10 00						3 00						43					20 64		33 64	6 72						Breaking and Cultivating.

ILLUSTRATION STATION CROP RECORDS.—Field E.—Rotation Three Years.—Description of Rotation: 1st year, Summer-fallow; 2nd year, Wheat; 3rd year, Oats.

Province and Post Office.	Area.	Rent of Land.	Date of Sowing.		Amount of Seed sown per acre	Date of Harvesting.		Items of Expense in Raising Crops.															Cost of one acre.	Cost of one bushel.	Cost of one ton.	Yield per acre—Grain.	Yield per acre—Hay.	Yield per acre—Hoe I Crop.	Kind of Crop and Cultivation.
								Seed, Twine and Use of Machinery.	Manual Labour.		Horse Labour (including teamster). Hours.									Value of Horse Labour.	Cost of Threshing.	Total Cost.							
			Month.	Date.		Month.	Date.		Hours.	Cost.	Single Horse.	Two Horses.	Three Horses.	Four Horses.	Five Horses.	Six Horses.	Seven Horses.	Eight Horses.										
													No.	No.	No.	No.	No.	No.										
SASKATCHEWAN.	Ac.	$ cts.			Lbs			$ cts.											$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts				
Assiniboia	5	10 00						3 00						10¾		24			20 04		33 04	6 60⅘						Summer-fallow.
Cabri	5	10 00	April	15	1¼	Aug.	25	12 79	6	1 20				63					30 24	21 24	75 47	15 09⅖	32	47⅛				Marquis Wheat.
Gull Lake	5	10 00						3 00						11		13			13 34		26 34	5 26⅘						Summer-fallow.
Herbert	2½	5 00	April	28	1¼	Aug.	20	6 39	3	0 60				27					12 96	10 00	34 95	13 98	35	40				Marquis Wheat.
Herbert	2½	5 00						1 50						8½					4 08		10 58	4 23						Breaking and Cultivating.
Kindersley	5	10 00	May	3	1¼	Aug.	25	12 69	17	3 40				23½	20				22 28	23 70	70 07	14 41	30⅜	47⅞				Marquis Wheat.
Maple Creek	5	10 00	April	17	1¼	Aug.	25	12 61	7¼	1 45			3	12	16½				15 93	20 00	59 99	11 99⅘	30	40				"
Pambrun	5	10 00						3 00						26	15½				20 87		33 87	6 77⅖						Summer-fallow.
Prelate	5	10 00	April	20	1	Aug.	27	10 81	2¾	0 55				11½	18				15 42	14 40	51 18	10 23⅗	35	28⅘				Marquis Wheat.
Shaunavon	5	10 00						3 00					39						15 99		28 99	5 81						Summer-fallow.
ALBERTA.																												
Bow Island	5	10 00						3 00						47					22 56		35 56	7 11⅕						Summer-fallow.
Carmangay	5	10 00						3 00						6		16			12 80		25 80	5 16						"
Empress	5	10 00						3 00						29½		23			28 42		41 42	8 28½						Breaking and Cultivating.
Foremost	5	10 00						12 79	10	2 00				18		8			13 60	25 96	63 35	12 87	27¼	47⅛				Marquis Wheat.
Grassy Lake	5	10 00						3 00						27½		14½			22 19		35 19	7 01⅘						Summer-fallow.
Jenner	5	10 00						3 00						68¼					32 80		45 80	9 16						Breaking and Backsetting.
Macleod	5	10 00						3 00						2		9		9	13 38		26 38	5 27						Breaking and Backsetting.
Magrath	5	10 00						13 45	11	2 20				17			9		14 37	31 35	71 37	14 27	25½	57				Marquis Wheat.
Manyberries	5	10 00	May	4	1	Aug.	29	10 87½	5	1 00				32					15 36	20 40	57 63	11 52⅗	33¾	34				"
Medicine Hat	5	10 00	April	17	1¼	Aug.	17	12 31	5	1 00				39					18 72	20 00	62 03	12 40⅗	31	40				"
Milk River	5	10 00						3 00						14½	31½		11		33 95		46 95	9 39						Breaking and Backsetting.
Pincher Creek	5	10 00						3 00						13		22			19 88		32 88	3 97⅗						Summer-fallow.
Whitla	5	10 00						3 00						60					28 80		41 80	8 63						Breaking and Backsetting.

ILLUSTRATION STATION CROP RECORDS.—Field F.—Rotation Three Years.—Description of Rotation: 1st year, Summer-fallow; 2nd year, Wheat; 3rd year, Oats.

SASKATCHEWAN.																													
Assiniboia	5	10 00						3 00						$10\frac{3}{4}$		24						33 04	6 $60\frac{4}{5}$					Summer-fallow.
Cabri	5	10 00	April	15	$1\frac{3}{4}$	Aug.	25	11 54	6	1 20				63					30 24	44 64		97 62	19 $52\frac{2}{5}$	20		$99\frac{1}{5}$			Banner Oats.
Gull Lake	5	10 00						3 00						11		13			13 34			26 34	5 $26\frac{1}{5}$						Summer-fallow.
Herbert	$2\frac{1}{2}$	5 00	April	28	2	Aug.	25	6 35	$2\frac{1}{2}$	0 50				$27\frac{1}{2}$					13 20	13 12		38 17	15 27	22		70			Banner Oats.
Herbert	$2\frac{1}{2}$	5 00						1 50						$8\frac{1}{2}$					4 08			10 58	4 23						Breaking and Cultivating.
Kindersley	5	10 00	May	3	2	Aug.	25	12 70	18	3 60				24	20				22 52	39 75		88 57	17 $71\frac{2}{5}$	$16\frac{4}{5}$		106			Banner Oats.
Maple Creek	5	10 00	April	17	2	Aug.	25	12 66	8	1 60			6	$16\frac{1}{2}$	$16\frac{1}{4}$				19 32	18 60		62 18	12 $43\frac{3}{5}$	20		62			"
Pambrum	5	10 00						3 00						25	$15\frac{1}{2}$				20 53			33 53	6 $70\frac{3}{5}$						Summer-fallow.
Prelate	5	10 00	April	26	2	Aug.	29	12 45	$2\frac{3}{4}$	0 55				$12\frac{1}{2}$	16				15 28	30 40		68 68	13 73	18		76			Banner Oats.
Shaunavon	5	10 00	"	28	2	"	31	11 70	6	1 20			6	27	7				16 47	28 70		68 07	13 $61\frac{2}{5}$	$16\frac{1}{2}$		82			"
ALBERTA.																													
Bow Island	5	10 00						3 00						29					13 92			26 92	5 $38\frac{2}{5}$						Summer-fallow.
Carmangay	5	10 00						3 00						6		16			12 80			25 80	5 16						"
Empress	5	10 00						3 00						$29\frac{1}{2}$		23			28 42			41 42	8 $28\frac{2}{5}$						Breaking and Backsetting.
Foremost	5	10 00			$1\frac{3}{4}$			11 76	12	2 40				19		8			14 08	41 16		79 40	15 88	$13\frac{1}{2}$		$117\frac{3}{5}$			Banner Oats.
Grassy Lake	5	10 00						3 00						$27\frac{1}{2}$		$14\frac{1}{2}$			22 19			35 19	7 $01\frac{4}{5}$						Summer-fallow.
Jenner	5	10 00						3 00						$68\frac{1}{4}$					32 80			45 80	9 16						Breaking and Backsetting.
Macleod	5	10 00						3 00						2		9		9	13 38			26 38	5 $27\frac{3}{5}$						Breaking and Backsetting.
Magrath	5	10 00	April	16	2	Aug.	26	13 47	11	2 20				18			9		14 85	30 66		71 18	14 $23\frac{3}{5}$	$16\frac{1}{4}$		$87\frac{2}{5}$			Banner Oats.
Manyberries	5	10 00	May	4	2	Aug.	29	12 45	5	1 00				32					15 36	24 16		62 97	12 $59\frac{2}{5}$	$20\frac{3}{5}$		$60\frac{1}{5}$			"
Medicine Hat	5	10 00	"	12	$1\frac{1}{2}$	"	17	10 73	7	1 40				32					15 84	30 00		67 97	13 $59\frac{2}{5}$	$22\frac{3}{4}$		75			"
Milk River	5	10 00						3 00							32		10		30 50			40 50	8 10						Breaking and Backsetting.
Pincher Creek	5	10 00						3 00						13		22			19 88			32 88	3 $97\frac{2}{5}$						Summer-fallow.
Whitla	5	10 00						3 00						66					31 68			44 68	8 $93\frac{3}{5}$						Breaking and Backsetting.

Field G (5 acres).

On account of the increasing demand for fodder and pure seed, alfalfa and Western rye grass are grown as follows:

Alfalfa, 2 acres, sown in rows 36 inches apart and one acre sown broadcast.

The object of this illustration is to find out by which method the largest crops can be produced at the least cost.

Western Rye Grass, 2 acres, sown broadcast.

During the season of 1915 both the alfalfa and Western rye grass made a very strong, even growth and judging from appearances in the spring of 1916, both should yield heavy crops.

Illustration Station Crop Records.—Field G. Description of Rotation: 1st year, Alfalfa, 3 acres.

Province and Post Office.	Area.	Rent of Land.	Date of Sowing.		Amount of Seed sown per acre.	Date of Harvesting.		Items o Expense in Raising Crops.															Cost of one acre.	Cost of one bushel.	Cost of one ton.	Yield per acre—Grain.	Yield per acre—Hay.	Yield per acre—Hoed Crop.	Kind of Crop and Cultivation.
								Seed, Twine and Use of Machinery.	Manual Labour.		Horse Labour (including teamster). Hours.										Value of Horse Labour.	Cost of Threshing.	Total Cost.							
			Month.	Date.		Month.	Date.		Hours.	Cost.	Single Horse.	Two Horses.	Three Horses.	Four Horses.	Five Horses.	Six Horses.	Seven Horses.	Eight Horses										
Saskatchewan.	Ac.	$ c			Lb.			$ c.	No.	$ c.	No.	No.	No.	No	No.	No.	No.	No.	$ c.	$ c	$ c	$ c	$ c	$ c.	Bush.			
Assiniboia	3	6 00						1 80						6		14½			11 87		19 67	6 55⅔						Summer-fallow.
Cabri	3	6 00	June	16	5			10 05						40½					19 44		35 49	11 83						Alfalfa.
Gull Lake	3	6 00						1 80						7		7¾			8 17		15 97	5 32¾						Summer-fallow.
Herbert	1½	3 00	June	24	5			5 02	4	0 80				17½					8 40		17 22	11 48						Alfalfa.
Herbert	1½	3 00						0 90						6					2 88		6 78	4 52						Breaking and Cultivating.
Kindersley	3	6 00	July	6	5			10 05	6	1 20				18	12				15 24		32 49	10 83						Alfalfa.
Maple Creek	3	6 00	June	4	6¾			10 05				5		7½	9¾				10 54		26 59	5 31						"
Pambrum	3	6 00						1 80						14½	9				11 91		19 71	6 57						Summer-fallow.
Prelate	3	6 00	May	26	5			10 05						4	9½				7 14½		23 19½	7 73						Alfalfa.
Shuanavon	3	6 00						1 80					25½						10 45½		18 25	6 08						Summer-fallow.
Alberta.																												
Bow Island	3	6 00						1 80						32					15 36		23 16	7 72						Breaking and Cultivating.
	3																											Summer-fallow.
Carmangay	3	6 00						1 80						4		10			8 12		15 92	5 30⅔						Breaking and Backsetting.
Empress	3	6 00						1 80								27			18 78		26 58	8 86						Alfalfa.
Foremost	3	6 00			5			10 05	24	4 80				11		5			8 38		29 32	9 74½						Summer-fallow.
Grassy Lake	3	6 00						1 80						17½		8¾			13 82		21 62	7 20¾						Breaking and Backsetting.
Jenner	3	6 00						1 80						41¼					19 80		27 60	9 30						Breaking and Backsetting.
Macleod	3	6 00						1 80						1		5½		5½	8 07		15 87	5 29						Breaking and Backsetting.

Magrath	3	6 00			5			10 05	17	3 40				9			5½		8 11		27 56	9 18							Alfalfa.
Manyberries	3	6 00						1 80						18					8 64		16 44	5 48							Summer-fallow.
Medicine Hat	3	6 00						1 80						12¼					5 88		13 68	4 56							"
Milk River	3	6 00						1 80						32¾					15 72		23 52	7 84							"
Pincher Creek	3	6 00						1 80						8			13		11 90		19 70	6 56							"
Whitla	3	6 00						1 80						40½					19 44		27 24	9 08							Breaking and Back-setting.

* Rate sown broadcast 10lb. per acre.

Illustration Station Crop Records. Field G. Description of Rotation: 1st year, Western Rye Grass, 2 acres.

Saskatchewan.																															
Assiniboia	2	4 00						1 20						4			9½		7 81		13 01	6 50							Summer-fallow.
Cabri	2	4 00	June	14	10			3 10						24					11 52		18 62	9 31							Western Rye Grass.
Gull Lake	2	4 00						1 20						5½		5¼			5 17			5 19							Summer-fallow.
Herbert	1	2 00	June	29	10			1 55	2	0 40				11½					5 52		9 47	9 47							Western Rye Grass.
Herbert	1	2 00						0 60						4					1 92		4 52	4 52							Breaking and Cultivating.
Kindersley	2	4 00	July	5	10			3 10	4	0 80				12½	8				10 40		18 30	9 15							Western Rye Grass.
Maple Creek	2	4 00	June	4	10			3 10	3½	0 70		2½			6½				5 99		13 79	6 89½							" "
Pambrum	2	4 00						1 20						10½	6½				8 48		13 68	6 84							Summer-fallow.
Prelate	2	4 00	May	26	10			3 10	3½	0 70				1½	6½				4 30		12 10	6 05							Western Rye Grass.
Shaunavon	2	4 00						1 20					17½						7 17		12 37	6 18							Summer-fallow.
Alberta.																															
Bow Island	2	4 00						1 20						22½					10 80		16 00	8 00							Breaking and Cultivating.
Carmangay	2	4 00						1 20						2		7			5 30		10 50	5 25							Summer-fallow.
Empress	2	4 00						1 20						2¾		18½			12 79		17 99	8 99½							Breaking and Back-setting.
Foremost	2	4 00			10			3 10	20	4 00				7		3			5 22		16 32	8 16							Western Rye Grass.
Grassy Lake	2	4 00						1 20						10		5¾			8 36		13 56	6 78							Summer-fallow.
Jenner	2	4 00						1 20						26¾					12 84		18 04	9 02							Breaking and Back-setting.
Macleod	2	4 00						1 20						1		3½		3½	5 31		10 51	5 25½							Breaking and Back-setting.
Magrath	2	4 00			10			3 10	3	0 60				3			3½		3 85		11 55	5 77½							Western Rye Grass.
Manyberries	2	4 00						1 20						12					5 76		10 96	5 48							Summer-fallow.
Medicine Hat	2	4 00						1 20						7¾					3 72		8 92	4 46							"
Milk River	2	4 00						1 20						21¼					10 20		15 40	7 70							"
Pincher Creek	2	4 00						1 20						5		9			7 98		12 18	6 09							"
Whitla	2	4 00						1 20						26½					12 72		18 92	9 46							Breaking and Back-setting.

Field H (5 acres).

Two-year rotation: Wheat and Corn alternately, 2½ acres each sown each year.

The object of this illustration is to grow a profitable crop and at the same time cultivate the soil sufficiently so as to eradicate weeds, conserve moisture and minimize summer-fallowing.

Illustration Station Crop Records.—Description of Rotation: 1st year.

Province and Post Office.	Area.	Rent of Land.	Date of Sowing.		Amount of Seed sown per acre	Date of Harvesting.		Items of Expense in Raising Crops.														Cost of one acre.	Cost of one bushel.	Cost of one ton.	Yield per acre—Grain.	Yield per acre—Hay.	Yield per acre—Hoed Crop.	Kind of Crop and Cultivation.
								Seed, Twine and Use of Machinery.	Manual Labour.		Horse Labour (including teamster) Hours.									Value of Horse Labour.	Cost of Threshing.	Total Cost.							
			Month.	Date.		Month.	Date.		Hours.	Cost.	Single Horse.	Two Horses.	Three Horses.	Four Horses.	Five Horses.	Six Horses.	Seven Horses.	Eight Horses.										
Saskatchewan.	Ac.	$ c.			Lb.			$ c.		$ c	No.	No.	No	No.	No.	No	No.	No.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	Bush.			
Assiniboia	2½	5 00						1 50						5½		12			10 08		16 58	6 63						Summer-fallow.
Cabri	2½	5 00	May	7	1¼	Sept.	30	6 39	3	0 60				31½					12 12	9 18	36 29	14 52	35½		40½			Marquis Wheat.
Gull Lake	2½	5 00						1 50						5½		6½			6 67		13 17	5 26						Summer-fallow.
Herbert	1¼	2 50	April	28	1¼	Aug.	20	2 42	2	0 40				14½					6 96	5 00	17 28	13 82	34¾		40			Marquis Wheat.
Herbert	1¼	2 50						0 75						9½					4 56		7 81	6 25						Breaking and Cultivating.
Kindersley	2½	5 00	May	3	1¼	Aug.	26	6 39	8	1 60				12¼	10				11 38	12 90	37 27	14 91	29		51½			Marquis Wheat.
Maple Creek	2½	5 00	May	20	1¼	Aug.	25	6 37	3	0 60			2	8¾	8				9 42	8 00	29 39	11 75¾	37		32			"
Pambrum	2½	5 00						1 50						15	7½				11 32		17 82	7 13						Summer-fallow.
Prelate	2½	5 00	May	8	1	Aug.	29	5 34	1⅔	0 33½				4½	9¼				7 25	6 40	24 32	9 73	38		25⅔			Marquis Wheat.
Shaunavon	2½	5 00	April	21	1¼	Aug.	31	5 90	3	0 60		6	10½	3½					8 02	12 25	31 77	12 70	26		33			"
Alberta.																												
Bow Island	1½	5 00						1 50						22¾					10 92		17 42	6 97						Breaking and Cultivating.
Carmangay	2½	5 00						1 50						3		8			6 40		12 90	5 16						Summer-fallow.
Empress	2½	5 00						1 50						3½		22¾			15 79		22 29	8 92						Breaking and Backsetting.
Foremost	2½	5 00			1¼			6 39½	4	0 80				10		4			7 28		29 92	11 97	31½	3	38			Marquis Wheat.
Grassy Lake	2½	5 00						1 50						13¾		7¼			11 10		17 60	7 04						Summer-fallow.
Jenner	2½	5 00						1 50						31¼					16 68		23 18	9 27						Breaking and Backsetting.
Macleod	2½	5 00						1 50						1		4½		4½	6 69		13 19	5 28						Breaking and Backsetting.
Magrath	2½	5 00			1¼			6 76	3	0 60				15			4½		10 30	14 52	37 18	14 87	28½		53			Marquis Wheat.
Manyberries	2½	5 00		3	1	Aug.	29	5 43	2½	0 05				16					7 68	10 14	28 75	5 77	34		33¼			"

Medicine Hat	2½	5 00						1 50						73					6 24		12 74	5 09½							Summer-fallow.
Milk River	2½	5 00						1 50						22¼	14½				18 65		25 15	10 16							"
Pincher Creek	2½	5 00						1 50						7		11½			10 99		16 99	6 78							"
Whitla	2½	5 00						1 50						27					12 96		19 46	3 89							Breaking and Cultivating.

Illustration Station Crop Records.—Description of Rotation: 1st year.

Saskatchewan.																															
Assiniboia	2½	5 00						1 50						5½		12			10 08		16 58	6 63							Summer-fallow.
Cabri	2½	5 00	May	25	1	Aug.	25	5 49	3	0 60	10			31					17 58		28 67	11 47							Corn.
Gull Lake	2½	5 00						1 50						5½		6½			6 67		13 17	5 27							Summer-fallow.
Herbert	1¼	2 50	May	28	1	Sept.	14	3 75	11½	2 30	5			13					7 59		16 14	12 96							Corn.
Herbert	1¼	2 50						0 75						9½					4 56		7 81	6 25							Breaking and Cultivating.
Kindersley	2½	5 00						1 50						7½	10				9 10		15 60	6 24							Summer-fallow.
Maple Creek	2½	5 00	May	26	1	Sept.	9	4 50	36	7 20		8	2	3¾	8				9 74		26 44	10 68							Corn.
Pambrum	2½	5 00						4 50	14	2 80	18½			6¾	4½				10 35		22 65	9 06							"
Prelate	2½	5 00	May	8	1	Aug.	29	4 50	1¾	0 35				8½	9¼				9 17		19 02	7 60							"
Shaunavon	2½	5 00	May	8	1	Sept.	10	4 50	20	4 00	15		14½						10 00		23 50	9 40							"
Alberta.																															
Bow Island	2½	5 00						1 50						22¾					10 92		17 42	6 97							Breaking and Cultivating.
Carmangay	2½	5 00						1 50						3		8			6 40		12 90	5 16							Summer-fallow.
Empress	2½	5 00						1 50						3½		22¾			15 97		22 29	8 92							Breaking and Backsetting.
Foremost	2½	5 00			1			5 05	9	2 70	5			14			4		10	55	23 30	9 32							Corn.
Grassy Lake	2½	5 00						1 50						13¾		7¼			11 10		17 60	7 04							Summer-fallow.
Jenner	2½	5 00						1 50						34¾					16 68		23 18	9 27							Breaking and Backsetting.
Macleod	2½	5 00						1 50						1		4½		4½	6 69		13 79	5 28							Breaking and Backsetting.
Magrath	2½	5 00	May	25	1	Aug.	9	4 50	16	3 20	7			3½			4½		6 67		19 37	7 73½							Corn.
Manyberries	2½	5 00						4 50	30	6 00	5			16					9 03		24 53	9 81							"
Medicine Hat	2½	5 00						1 50						13					6 24		12 74	5 09½							Summer-fallow.
Milk River	2½	5 00						1 50						22¼	14¼				18 65		25 15	10 06							"
Pincher Creek	2½	5 00						1 50						7		11½			10 49		16 99	6 78							"
Whitla	2½	5 00						1 50						27					12 96		19 46	7 78							Breaking and Cultivating.



Illustration Plot. Magrath, Alta.



Wheat on Illustration Station, Cabri, Sask.

DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE
DOMINION EXPERIMENTAL FARMS

REPORT

FROM THE

DIVISION OF EXTENSION AND PUBLICITY

FOR THE YEAR ENDING MARCH 31, 1916

PREPARED BY

The Chief Officer, Division of Extension and Publicity,
Central Farm - - - - - - - - - - - - - - - - - J. F. Watson.

Superintendent:—
Experimental Station, Charlottetown, P.E.I. - - - - - J. A. Clark, B.S.A.
Experimental Station, Kentville, N.S. - - - - - - - - W. S. Blair.
Experimental Farm, Nappan, N.S. - - - - - - - - W. W. Baird, B.S.A.
Experimental Station, Fredericton, N.B. - - - - - - - W. W. Hubbard.
Experimental Station, Ste. Anne de la Pocatière, Que. - Joseph Bégin.
Experimental Station, Cap Rouge, Que. - - - - - - - - G. A. Langelier.
Experimental Station, Lennoxville, Que - - - - - - - J. A. McClary.
Experimental Farm, Brandon, Man. - - - - - - - - - W. C. McKillican, B.S.A.
Experimental Farm, Indian Head, Sask. - - - - - - - W. H. Gibson, B.S.A.
Experimental Station, Rosthern, Sask. - - - - - - - - Wm. A. Munro, B.A., B.S.A.
Experimental Station, Scott, Sask. - - - - - - - - - M. J. Tinline, B.S.A.
Experimental Station, Lethbridge, Alta. - - - - - - - W. H. Fairfield, M.S.
Experimental Station, Lacombe, Alta. - - - - - - - - G. H. Hutton, B.S.A.
Experimental Station, Summerland, Alta. - - - - - - - R. H. Helmer.
Experimental Station, Invermere, B.C. - - - - - - - - G. E. Parham.
Experimental Farm, Agassiz, B.C. - - - - - - - - - - P. H. Moore, B.S.A.
Experimental Station, Sidney, B.C. - - - - - - - - - L. Stevenson, B.S.A., M.S.

REPORT FROM THE DIVISION OF EXTENSION AND PUBLICITY.

OTTAWA, March 31, 1916.

THE DIRECTOR,
Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith the first annual report from the Division of Extension and Publicity.

After the preliminary work of 1914, the Division was formed in the spring of the following year. Much of the labour of organization had already been done and the plans formed have, in the main, been followed throughout the past year's work; but, as happens in most new undertakings, unforeseen lines of effort presented themselves, new avenues of extension work were opened up, making necessary some modifications and expansions in the original scheme for the year's operations. These changes and additions entailed the surmounting of many difficulties and the rapid adjustment of arrangements to meet new conditions. However, having in mind the fact that systematic effort to disseminate a knowledge of the work of the Experimental Farms was practically a new and untried field, it may justly be said that the results of the first year were most gratifying. These results, and the experience gained therefrom, form an incentive and a basis for future effort.

The year's work followed four main lines: (1) The issuing of "Seasonable Hints"; (2) the enlargement of the mailing list; (3) the issuing of exhibition circulars; (4) the preparation and management of Experimental Farms' Exhibits. In the following pages will be found a brief account of what has been accomplished in each of the above directions. The work itself having been before the public throughout the year, great detail in this report would appear unnecessary. The heavy correspondence, the numerous requests from exhibition managers for the Experimental Farms' exhibit, and the great increase in the mailing lists, are evidence of the general interest awakened.

I am indebted to the Superintendent of the Rural Mail Delivery Branch for very considerable assistance in supplying lists of rural routes and box holders, and would also express my appreciation of the spirit of co-operation shown by the Canadian banks. The officers in charge of Divisions at the Central Farm and the Superintendents of the branches also contributed greatly to the success of the work.

I have the honour to be, sir,
Your obedient servant,

J. F. WATSON,
Chief Officer.

CENTRAL EXPERIMENTAL FARM.

"SEASONABLE HINTS."

Of this pamphlet, Nos. 1, 2, and 3 were issued during the year. By its means it is planned to get into more immediate touch with the farmer than is possible through reports and bulletins. Each issue was confined to sixteen pages, the material being contributed by the officers in charge of the various divisions of the work. No attempt was made to treat of any subject exhaustively within the narrow limits prescribed for this publication; the sole aim, as indicated by the title, was to deal briefly and practically with some of those features of farm work which were demanding attention at the time each issue reached the farmers' hands.

The "Hints" has already done much in arousing interest in the work of the Experimental Farms. A large increase in correspondence has resulted and among the many letters received there have been hundreds from all parts of Canada, containing spontaneous expressions of approval.

At the request of some of the principal Canadian banks, arrangements were made whereby, in each rural branch of these, a special desk so placed as to attract customers' attention, was furnished with a supply of 'Seasonable Hints' and of mailing list forms. The managers of these branches have also sent in some 200,000 names of farmers in their districts. Each of these has been, or will be, communicated with directly in the endeavour to get them interested in the work of the Farms and readers of its publications. The following banks have co-operated in this work:

Dominion Bank.
Bank of Hamilton.
Hochelaga Bank.
Home Bank of Canada.
Imperial Bank.
Bank of Nova Scotia.
Bank of Montreal.
Bank of British North America.
Bank of Toronto.
Molson's Bank.
La Banque Nationale.
Merchants Bank.
Union Bank of Canada.
Royal Bank of Canada.
Bank of Ottawa.
Standard Bank of Canada.
Northern Crown Bank.
Sterling Bank of Canada.
Weyburn Security Bank.
Metropolitan Bank.
Canadian Bank of Commerce.

THE MAILING LIST.

The issuing of publications is naturally the chief means of making known to the farming community the results of the work of the Experimental Farms. During the past year, the Division has made every effort to increase the mailing lists, so that a wider distribution of printed information may be made. Circular letters were sent out to boxholders on rural delivery routes; by this means a large number were reached who were quite unfamiliar with the Farms' work. The invitation to join the mailing list has been given prominence in each issue of 'Seasonable Hints,' and the aid given by the banks, referred to above, has resulted in many names being added. At each exhibition and fair attended an invitation was given to all visitors to give in their names.

By the above means the lists have been increased from 70,000 to about 225,000 names. As rapidly as equipment will permit, it is hoped to give every farmer in Canada a personal invitation to have his name placed on the mailing lists of the Department. This is, of course, a very heavy undertaking and before its inception requires much time and thought in perfecting machinery to handle the great influx of names which would result.

OTTAWA.

EXHIBITION CIRCULARS.

These were got out, primarily, for distribution at all fairs where a Dominion Experimental Farms Exhibit was made. They have proved their great value as a means of arousing interest and spreading information. They are brief, popularly-written treatises and the collection covers most of the main features of Canadian agriculture. Besides those distributed at fairs, there has been a considerable number sent by mail to applicants and a wide use has been made of them in answering correspondents making enquiries on the subjects treated of therein. The list of the Exhibition Circulars issued during the past fiscal year is as follows:—

Number.

1. Natural Incubation.
2. Artificial Incubation.
3. Varieties of grain recommended by the Dominion Cerealist for Manitoba and Saskatchewan.
4. Varieties of grain recommended by the Dominion Cerealist for Alberta.
5. Distribution and Sale of Seed Grain.
6. The Farmers' Poultry House.
7. Profitable Field Root Varieties for Ontario and adjacent parts of Quebec.
8. Profitable Field Root Varieties for the Maritime Provinces and Eastern Quebec.
9. Crop Rotations for Central and Eastern Canada.
10. Awnless Brome Grass vs. Western Rye Grass.
11. Growing Grapes for Home Use.
12. The Farm Flock.
13. Brooding and Rearing of Young Chicks.
14. Sweet Clover—The Truth.
15. Top Grafting.
16. Hot Bed and Cold Frames.
17. Protection of Fruit Trees from Mice and Rabbits and care of Injured Trees.
18. Bee-Keeping in Canada.
19. Tobacco Culture in Canada.
20. Clean Milk.
21. Profit from Dairy Cows.
22. Coulommier Cheese.
23. Cream Cheese and Butter.
24. Seed Treatment for Grain Smut.
25. Catalogue of Publications.
26. The Farmer as a Manufacturer. Part I.
27. The Farmer as a Manufacturer. Part II.
28. The Farmer as a Manufacturer. Part III.
29. Duck Raising.
30. The Management of Turkeys.
31. The Management of Geese.
32. Nature's Bank.
33. The Feeding of Live Stock.
34. The Farm Well.
35. Crop Rotations for Dry Farming Districts of Canada.
36. Varieties of Grain Recommended by the Dominion Cerealist for British Columbia.
37. Varieties of Grain Recommended by the Dominion Cerealist for Quebec and Ontario.
38. Varieties of Grain Recommended by the Dominion Cerealist for the Maritime Provinces.
39. Planning the Home Lot.
40. Beautiful Homes and How the Farmer May Make Them
41. Tile Drainage of the Farm.
42. Lime Water for the Preservation of Eggs.
43. Trap Nests.
44. Potato Scab.
45. Do You Know Your Weeds?
46. Apple Scab.
47. Seed Oats.
48. Forage Crops and Pasture Grasses.
49. How the Ripening of Grain Crops May Be Hastened.
50. Potato Growing in the Maritime Provinces.
51. Facts About Honey.

THE MULTIGRAPH.

The work of the Division would have been greatly hampered without the multigraph which was placed in its charge about six months ago. A number of short press notices were issued during the year and sent out for publication. These dealt mainly with problems arising from seasonal conditions, etc., where it was essential that the information or advice be in the farmers' hands promptly. Had it been necessary to have the press copy printed, the delay would have greatly reduced, if not destroyed, the value of the articles in question.

In addition, large numbers of cards, hand bills, report forms, circular letters, etc., have been run off for this and other Divisions of the Central Farm and also for the branch Farms, effecting a considerable saving in bills for printing. In all 44,330 copies of the above have been made on this machine.

EXHIBITIONS.

This was one of the main features of the work of the Division of Extension and Publicity, during the year. By Experimental Farm displays at exhibitions and fairs, an endeavour was made by ocular demonstration to introduce the work of the Farms and to press home some of the results obtained therefrom.

In past years a few exhibits had been made here and there, but they were small in number, were without definite plan, and depended for their material upon that available at the nearest Experimental Farm or Station. Many features of the work were not represented and there was, perhaps, a tendency to make the useful, secondary to the ornamental side of the display. It was possible this year further to organize and perfect the scheme incepted in 1914. The main features of the plan were as follows:—

1. To make known not only the lines of work going on at the Central Farm, but also, and more particularly, the work of the branch Farms and Stations, and to induce the farmers to get into touch with the Farms nearest them, since by this means, they would receive information more promptly and from a source more in immediate contact with their local conditions.

2. While endeavouring to make the exhibit attractive, to make the useful, instructional side of it pre-eminent.

3. Using the Central and branch Farms as centres, to arrange circuits for portable exhibits, embracing as many fairs in each circuit as possible, and endeavouring to cover as many agricultural districts as might be, in all parts of Canada. There were, of course, many sections where no Farm exhibit was shown last year, and there is great room for expansion in this regard. Clashing of dates of fairs and transportation difficulties prevented exhibiting in some cases, but 145 fairs were attended in all during the season of 1915. It is hoped to cover more ground next year and to pay special attention to the smaller fairs as it is felt that a considerable proportion of farmers are unable to attend the larger exhibitions.

Outside of the Central Canada Exhibition at Ottawa, and those fairs in the neighbourhood to which an exhibit was sent directly from the Central Farm, the plan adopted was to have an exhibition staging made up here and shipped to each branch Farm. At the Central Farm models of buildings and apparatus were also made, and many of the main features of the exhibit prepared. The branch Farms receiving this material added thereto displays of the results in the lines of work carried on at such branch Farms, arranged for fresh supplies of fruits, vegetables and flowers throughout the exhibition circuit and sent men with the exhibit to set it up at each fair, arrange for transportation, reply to visitors' inquiries, take names for the mailing list and distribute publications. By this means, while a definite, uniform plan of advertising

the Experimental Farms' system as a whole was made possible, opportunity was afforded each branch Farm of introducing features of local interest. That the scheme as a whole was a good one is evidenced by the numerous letters of commendation received from exhibition managers and from the general public.

The portable exhibits sent out directly to fairs from Ottawa were similar to those sent the branch Farms for their circuits. The panels were made of beaver board painted in two shades of brown with gold lines. The table covers were green and the curtains dark green. The colour scheme was pleasing, and the beaver board made the whole serviceable yet light and easy to erect and take down. The panels were made so as to set up in any form to suit the shape of building met with.

Three circuits were operated from Ottawa and in addition special exhibits were sent to Richmond and to Russell. These circuits and the attendants at each were:—

No. 1 (*Mr. F. Bingham*)—

Perth, August 31-September 2.
Belleville, September 6-7.
Brighton, September 9-10.
Oshawa, September 13-15.
Weston, September 17-18.
Niagara-on-the-Lake, September 21-22.
Beamsville, September 23-24.
Cayuga, September 27-28.
Fort Erie, September 29-30.
Burford, October 5-6.
Simcoe, October 12-14.

No. 2 (*Mr. W. Croskery*)—

London, September 10-18.
Parkhill, September 23-24.
Thedford, September 27-28.
Forest, September 29-30.
Wheatley, October 4-5.
Blenheim, October 7-8.
Burlington, October 11.
Milton, October 12-13.

No. 3 (*Messrs. G. Muir, R. White, F. Brown, in turn*)—

Brockville, September 7-8.
Napanee, September 14-15.
Barrie, September 20-22.
Bradford, September 25-28.
Newmarket, September 29-October 1.
Bolton, October 4-5.
Dundalk, October 7-8.

CENTRAL CANADA EXHIBITION.

This was held September 10-18, 1915. The Farms' exhibit thereat did not differ in character from those shown at other fall fairs in Canada, but the greater space allowed, and the fact that transportation was not a difficulty to be overcome, permitted of more elaborate staging. A few notes descriptive of this exhibit, but applicable generally to all the other exhibits shown throughout the Dominion, may be of interest. These notes are followed by brief reports on the Exhibition circuits served from the branches.

The exhibit was arranged in court fashion at the north end of the new Horticultural Building; the arrangement and artistic design, though secondary to the exhibit proper, showed it off very effectually. The exhibit as it appeared to people entering the building by the main entrance is illustrated herewith.

The complete exhibit included something from each Division of the Central Farm. The space allotted to the Animal Husbandry Division was taken up principally by models, one of the most valuable of which, from an educational viewpoint, was a plank frame truss barn and cattle stable showing the Rutherford system of ventilation. Other models were a portable hog cabin, a silo, a sheep feed rack for hay and grain, a lamb feed trough, and a sheep dipping tank and enclosure. Another model showing the wastage or loss of valuable plant food which occurs by leaching and evaporation from the manure pile, attracted a great deal of attention; a pile of manure of 8,000 pounds exposed under the same conditions to which a great many piles are exposed, was shown to diminish 3,900 pounds in three months. Photographs of the interior and exterior of some of the buildings on the Central Farm were hung on the panels and various legends as, "Flushing the ewes well on extra good pasture before the breeding season will mean more and stronger lambs next year," "Winter a few cows well—more money than wintering many cows badly," or the information that "Free working plans of farm buildings may be had on request," indicated that the Animal Husbandry Division was at the disposal of every farmer who cared to use it.

OTTAWA.

Samples of butter, cream cheese, and Coulommier cheese in cold storage, with the outfits for making them, were shown, also the comparative values of milk marketed at a cheese factory, as butter, as pure city milk, as Coulommier cheese and as cream cheese. A babcock tester with a spring milk balance and milk record sheets, and some simple and important veterinary appliances and medicines completed the exhibit from this Division.

Poultry Division.—The exhibit from the Poultry Division comprised models of a portable colony house, a permanent "Farmer's" poultry house for 100 hens, various feed and grit hoppers and a simply-made trap nest. An electric incubator and hover in which were newly hatched chicks, attracted considerable attention. Egg cartons and boxes and shaping boards showing how to pack dressed poultry properly for shipping were also shown. A special feature of this exhibit was a minature pond in which were specimens of ducks and geese of the breeds best-known in Canada. Timely and valuable legends were in evidence in this exhibit also, such as "Market the old hens as soon as the breeding season is over," "Dispose of all non-producers," and the information that ducks should be marketed "green" that is when they get their first coat of feathers from 10 to 12 weeks of age, and no water should be given them to swim in. The statement that 66 green ducks (Pekin) sold by the Central Experimental Farm at 10½ weeks of age brought nearly 200 per cent on cost of feed is worth looking into by any person who is in a position to keep waterfowl.

Field Husbandry Division.—A very interesting and valuable feature of the Field Husbandry exhibit was a model of a field which was thoroughly underdrained. The two main systems of underdraining, the Gridiron and the Herring Bone systems, were shown under conditions that required each special system. Running water through the miniature tile served to make the need of underdrainage very apparent. Samples of good and poor tile with correctly and incorrectly made joints, a homemade drainage level and a small model of a sand trap were shown. On the panel two enlarged photos of corn, one on well drained land and the other on undrained land, showed a very striking difference in favour of the corn on well drained soil.

At the end of the Field Husbandry exhibit a space was allotted for Exhibition Circulars which were distributed to those who desired them. The mailing list was also kept here and the names of all desiring to receive the Dominion Experimental Farms publications were taken and filed. Posters such as, "Register here if you wish to obtain the publications of the Experimental Farm, no charge," or "We will send our publications to you *free of charge,* what are you interested in? Write your name, post-office and province."

Tobacco Division.—Samples of tobacco leaf for pipe and for cigar fillers and wrappers were put up very attractively. On the panel were illustrations of a tobacco truck.

Botanical Division.—Some samples of flax were on exhibition, showing the various stages through which it must go in being manufactured from flax straw into the finest Irish linen. The Experimental Farms are now investigating the possibilities of growing flax for fibre. If the experiments prove successful, and there is no reason apparent why they should not, farmers will be able to make flax a much more profitable crop than it is at present. Various plant diseases, and weeds in different stages of growth were also shown. The exhibit of diseased potatoes was particularly good.

Cereal Division.—The cereal exhibit consisted of displays, in receptacles and in the sheaf, of those varieties of grain which are recommended by the Dominion Cerealist for the different districts throughout Canada. Varieties originated on the Dominion Experimental Farms were given prominence; foremost amongst these was the now famous Marquis wheat which holds the world's record for largest yield, and is the winner of the World's Championship for the best bushel of wheat for four successive years, 1911-1914. This wheat, by its early maturity, has added millions of acres to the wheat producing area of Canada.

OTTAWA.

The Prelude wheat which was produced for extreme northern districts where the higher yielding and later varieties will not mature, matures in ninety days and gives a fair yield with a high weight per bushel.

Division of Forage Plants.—This exhibit consisted of specimens of various recommended varieties of roots, ensilage corns, and grass and clover seeds.

Legends such as "Insure your clover and alfalfa crop against *winter killing*, by growing your own seed," or "Why buy your root seed when you can grow better seed at home that will produce larger crops," were displayed. A one-half acre plot at the Central Experimental Farm produced this year 267 pounds of Mammoth Long Red Mangel seed. Photographs showing fields under various forage crops were shown.

Horticultural Division.—The space allotted to this Division was not filled with a large, indiscriminate display of fruits, but consisted of specimens of varieties of fruits recommended for the Ottawa Valley, seedling apples originated on the Central Farm, also cross-bred apples of good quality. Seedlings of such standard varieties as McIntosh Red and Wealthy were grouped around the parent in such a way that they might be compared most conveniently. Of 1,288 seedlings of apples which have fruited at the Experimental Farm at Ottawa only 96 have been named.

Home production of vegetable seed was recommended and specimens of cauliflower, cabbage, and celery in seed, in plots, were to be seen.

What is being done along plant breeding lines was shown by specimens of early varieties of sweet corn and tomatoes, showing the original variety and the following generations.

A very attractive feature of this exhibit was a model of a farm, showing ideal farm home surroundings. The legend above it read, "The Ideal for Canada's Farmer," with twenty reasons why the farmer should pay more attention to the improvement and beautifying of the farm home surroundings.

A model of a good hotbed showing the construction in detail attracted a great deal of attention.

Bee Division.—An observation hive in which the bees could be seen at work was an interesting feature of this exhibit. Samples of clover, buckwheat, dandelion, fireweed and basswood honey, were very attractively put up and arranged, and various cakes and biscuits made with honey were in evidence, with the legend,—"Cakes and biscuits made with honey never become stale." A beginners's outfit, including a 10-frame Langstroth hive and a honey extractor, completed this exhibit.

Division of Chemistry.—In the chemistry exhibit there was available to the wide-awake farmer a great deal of valuable information if he would take the time to go through the exhibit thoroughly. On one end of the table two samples of cotton seed meal were shown, one of which was worth $27 per ton and the other $37 per ton, yet the market price of these two grades of feed was practically the same. On analysis the dearer one of these feeds was shown to be much higher in protein and fat content than the other—hence its greater value. It follows that it pays to note the chemical analysis of all commercial cattle feeds when buying them. In another section of the exhibit the greater capacity of loam soil over sandy soil for holding water was demonstrated by means of glass tubes of different bores wherein the height to which water will rise by capillarity could be readily seen.

Next came a group of commercial fertilizers which replaced the three most important elements of plant food of which a soil may become deficient, namely, nitrogen, phosphoric acid, and potash. Ordinary barnyard manure has been shown by analysis to replace all three of these important plant food constituents.

Samples of rock from which our common types of soil have originated were shown. The correct and incorrect location of the farm well was demonstrated by means of a diagram or chart.

OTTAWA.

EXPERIMENTAL STATION FOR PRINCE EDWARD ISLAND, CHARLOTTETOWN, P.E.I.

J. A. CLARK, B.S.A., SUPERINTENDENT.

EXHIBITION AND EXTENSION WORK.

During 1915 the Experimental Station at Charlottetown was represented at six agricultural exhibitions in the province.

The first attended was the third annual flower show conducted by the Prince Edward Island Floral Association, held at Charlottetown, August 24-25. This was largely attended and the Station exhibit of sweet peas, consisting of one hundred and ten named species, and a large variety of other cut flowers, was especially attractive. The observation hive attracted much attention and considerable information was distributed on the subject of bee culture.

The second show of the season was the Provincial Exhibition held at Charlottetown on September 21-24. The attendance was between twenty-five and thirty thousand. The Station exhibit occupied a central portion of the main building and a great deal of admiration was expressed for the beautiful tinting of the panels and the arrangement of the roots, vegetables and sheaves of grain. One sheaf of Lincoln oats, measuring approximately sixty-eight inches in height was greatly admired. The observation hive received a great deal of attention as, in fact, did all the models. The one demonstrating the shrinkage of manure while in compost, was one of the most useful and instructive models shown. Many who saw it and had it explained to them were deeply impressed with its teaching.

On either side of the central panel were two large sheaves of corn which had attained the height of over eleven feet. These were greatly admired and many questions were answered regarding their cultivation, the fertilizers used, etc., and several varieties of both sweet and field corn were recommended to the large number of people who seemed interested in the subject.

A large number of names were secured for the mailing list, and many circulars were distributed.

The third show of the season, the Kings County Exhibition, held at Georgetown, September 29, was rather poorly attended. However, a few names were secured for the mailing list, and some literature was distributed.

The fourth show attended was the Prince County Exhibition, held at Summerside, September 30 and October 1. There was a good attendance on both days. The space allotted permitted of the erection of the whole panelling, so that all the models and legends were placed on exhibition. The Station exhibit of roots and grains attracted much attention, also the models of henhouses, plank frame truss barn and silo. A number of names were secured for the mailing list and considerable information was given in regard to the different models, their advantages and practical uses.

The fifth show was a general agricultural exhibition held at Souris, Kings county, October 5. The space allotted enabled about half the models and legends to be exhibited, along with the Station grain and potatoes. A large number of questions were answered regarding the different models. A number of names were secured for the mailing list, and some bulletins were distributed.

The last show attended was held at Alberton, Prince county, October 13. There was a good attendance and a number of names were added to the mailing list. A large number of circulars were distributed. The observation hive attracted a good deal of attention, and considerable information was given with reference to the obtaining of barn plans, etc.

EXPERIMENTAL STATION FOR ANNAPOLIS AND CORNWALLIS VALLEYS, KENTVILLE, N.S.

W. S. BLAIR, SUPERINTENDENT.

EXHIBITION AND EXTENSION WORK.

An exhibit of produce grown at this Station and models of farm buildings, poultry equipment, apiary supplies, etc., was put up at Nova Scotia Provincial Exhibition, Halifax, N.S., September 8-16. The same exhibit was shown at Bridgewater, Lunenburg county, N.S., September 29 to October 1.

The exhibit occupied a wall space of 60 feet with a table three feet wide in front on which the produce and various models were displayed. Leaflets, bulletins and reports were distributed to the many visitors who took occasion to study the exhibit. The farmers visiting the exhibition were apparently interested and desirous of securing reliable information.

EXPERIMENTAL FARM FOR NOVA SCOTIA, NAPPAN, N.S.

W. W. BAIRD, B.S.A., SUPERINTENDENT.

EXHIBITION AND EXTENSION WORK.

The exhibit from this Farm consisted of material sent from Ottawa, together with samples of the varieties of grain most suitable for Nova Scotia, bottled fruit and honey. The exhibit was staged at Halifax, Shubenacadie, Guysboro', Antigonish, and the Maritime Winter Fair.

The Halifax Exhibition from September 8 to 16, was very well attended. Many questions with reference to the demonstration models were asked and information given.

From September 22 to 24, the exhibit was displayed at Shubenacadie. At this exhibition, many of the farmers from the surrounding district were in attendance, and consequently a great deal of interest was shown in the Farms' exhibit, and a large number of circulars, especially on live stock work and cereals, were distributed.

The Guysborough exhibition was held September 28 and 29, and notwithstanding unfavourable weather the attendance was very fair, great interest being shown in the agricultural exhibits.

The exhibit was shown at Antigonish from September 30 to October 1. Many questions were asked on the work of the Experimental Farms, and numerous circulars and bulletins distributed.

EXPERIMENTAL STATION FOR NEW BRUNSWICK, FREDERICTON, N.B.

W. W. HUBBARD, SUPERINTENDENT.

EXHIBITION AND EXTENSION WORK.

The full exhibit from this Station was shown at St. Stephen, Fredericton, and Chatham, while at Centreville where the fair occurred on the same day as the one at Chatham, an exhibit was staged showing potatoes, apples and grain, illustrating potato diseases, etc. At St. Stephen and Centreville many visitors were present from the state of Maine.

SESSIONAL PAPER No. 16

EXPERIMENTAL STATION, STE. ANNE DE LA POCATIERE, QUE.

JOSEPH BEGIN, SUPERINTENDENT.

EXHIBITION AND EXTENSION WORK.

For some years past, the agricultural societies of the eastern part of the province of Quebec have not, apparently, taken a great interest in the holding of local fairs. There are some exceptions, however. The Agricultural Society of Montmagny county holds a fair every two or three years and the well-known Horticultural Society of L'Islet has held an annual fair since its inception, forty-two years ago.

MONTMAGNY.

The fair this year was held on September 17 and 18, and the exhibit from the Dominion Experimental Farms was an attractive and prominent feature. The attendance was between eight and nine thousand and great interest in the Farms' exhibit was shown by all. A great deal of information was furnished visitors, on growing fruits and vegetables, bee-keeping and flax and tobacco growing.

A specially interesting feature was an exhibit of different varieties of corn for ensilage, at various stages of growth. This aroused much questioning and discussion on the place of ensilage corn in the rotation, preparation of land for the crop, sowing, cultivation, etc.

The models and legends also interested a great many.

STE. ANNE DE LA POCATIÈRE.

This was the first fair of the kind to be held here and was arranged for jointly by the Experimental Station and the Horticultural Societies of Kamouraska and L'Islet.

The fair was a great success, some 7,000 farmers attending. A special feature was the display of excellent varieties of fruits. The Station exhibit aroused great interest and a wide distribution of publications was made both here and at Montmagny.

EXPERIMENTAL STATION, CAP ROUGE, QUE.

G. A. LANGELIER, SUPERINTENDENT.

EXHIBITION AND EXTENSION WORK.

The Cap Rouge Station had an exhibit at six Provincial Exhibitions and four County Fairs, in 1915.

THREE RIVERS.

This is a provincial exhibition and was held in the above named city from August 21 to 28. About 3,000 persons saw the Station's installation which was awarded a diploma for "the best exhibit of agricultural and horticultural products." The space covered was 75 feet by 10, 4 feet on the table and 6 on the wall. The background was made of panels sent from Ottawa, with bunting above. In the middle was a map showing the location of the Experimental Farms and Stations throughout Canada. On each side were small sheaves of the different varieties of wheat, oats, barley, and field peas grown in the experimental plots at Cap Rouge; these were tied with coloured ribbon, were properly labelled so that visitors could see what they were, and in front of each was a bottle containing grain of the same variety. There were also four large sheaves, about forty inches in diameter, made up of Banner oats, Manchurian barley, Huron wheat, and timothy; in front of the first three were cards saying that they are the kinds specially recommended for this district. Then came models of rotations, of shrinkage of manure heaps, of farm buildings, of hot-beds, of poultry houses, all of which interested farmers very much. Besides the above, there were a great many varieties of corn for silage, grasses, tobacco, fruit, vegetables, flowers, eggs and honey. Two observation hives seemed to be a centre of attraction, as there was always a crowd around them. What interested visitors most was poultry, about which more information was asked for at this exhibition than anything else. The association is very keen to get an exhibit from the Station another year.

QUEBEC CITY.

This Exhibition is a provincial one and was held in the above named city from August 28 to September 4. About 8,000 persons passed through the Hall of Industry, where the Station's exhibit was staged. The space covered was 115 feet by 10. More room than usual was occupied and a more elaborate display made, on account of the celebration of the 25th anniversary of the Good Farms Competition, a whole wing of the Palace of Industry being used by the Federal and Provincial Departments of Agriculture. It was admitted by everybody that, at no time or place, in the province of Quebec, has such a display of agricultural and horticultural products been made as was done here in 1915 by the two Governments. The Farms' installation was about as at Three Rivers, but on a larger scale. A special attraction was the name of the Station in large letters of white candytuft placed in green moss. What seemed to interest farmers most was vegetables, fruit, flowers, and honey. A gold medal was awarded to the Station, the third year in succession, for its exhibit.

ST. CASIMIR.

This is the Portneuf County Fair, and it was held on September 8. The association built a shed to take in the Station's exhibit, which occupied a space of 80 feet by 10. About 1,000 persons saw the installation from Cap Rouge and the exhibit of grain interested visitors most.

16—1916—100a



Experimental Farms Exhibit Central Canada Exhibition, 1915.



Experimental Farms Exhibit. Charlottetown, P. E. I.



1915.—Exhibit Dominion Experimental Station, Fredericton, N.B., at Fredericton Exhibition.



Exhibit made by Lennoxville Experimental Station, 1915.



Experimental Farms Exhibit. Grand Forks, B. C.



Experimental Farms Exhibit, Burton, B. C.

PLESSISVILLE.

This is the Megantic county (Division B) Fair and it was held on September 14. The exhibit from Cap Rouge occupied a space of 60 feet by 10, and interested very much the 700 visitors who saw it. Grain and corn for silage were the topics about which most farmers made enquiries.

VICTORIAVILLE.

This is the Arthabaska County Fair, and it was held on September 21. The Station's exhibit covered a space of 80 feet by 10 but was seen by only about 500 people as it rained during the day of the fair. Vegetables seemed to interest visitors very much at this place.

CHATEAU RICHER.

This is the Montmorency County Fair and it was held on September 30. The Station's exhibit filled the lower flat of a two-story 45 by 20 construction whilst the upper part was used by the association for farm products shown in competition. This building is quite a distance from where the live stock was and not more than 300 persons came in. Fruit was of the most interest to visitors here.

NEW ENGLAND FAIRS.

At the request of Mr. Theo. Hamel, Colonization Agent of the Dominion Government, Quebec, and with the authorization of the Director of Experimental Farms, collections of vegetables, grain and honey were prepared for four New England Fairs: Central Maine, Rockingham, Lancaster, N.H., and Rochester, N.H. Though not in competition, these exhibits were awarded a special first prize ribbon at each of these fairs.

GETTING IN TOUCH WITH AGRICULTURISTS.

Besides their great educational value, these exhibits afford an excellent opportunity to the Superintendent, his assistant, and the men in charge, to come into intimate contact with a great number of farmers who have not yet visited the Station, and there is no doubt that everybody derives great benefit from this closer association. Oftentimes, interesting problems are discussed which lead to a visit by the Superintendent to a farm where local conditions require special methods. When on the ground a couple of neighbours are met and generally a small excursion from that parish comes to the Station within a short time. It seems that this is getting into close touch with the farmer which is certainly an advantage to all concerned.

SECURING NAMES FOR THE MAILING LIST.

The work of the Experimental Farms system should be of value to the greatest possible number of people, and the majority, for the present at least, can only be reached by publications giving the result of the research work undertaken all through the country. As it is the aim to send out these publications to as many farmers as possible, one of the main things, at exhibitions, is to secure the names of persons interested in agricultural matters. At the six fairs where this Station had an exhibit, about 2,400 names were secured for the mailing list. All these will receive the bulletins issued by the Experimental Farms which will materially add to the value of the great educational campaign undertaken at exhibitions.

CAP ROUGE.

EXPERIMENTAL STATION FOR THE EASTERN TOWNSHIPS, LENNOXVILLE, QUE.

J. A. McCLARY, SUPERINTENDENT.

EXHIBITION AND EXTENSION WORK.

The fall of 1915 marked the beginning of the Farms' exhibition work at the local fairs of the Eastern Townships. Six fairs were attended and exhibits set up, varying in their component parts as was deemed wise. For the local fairs, the main exhibit was divided into two parts, so that if two fairs occurred on the same date, they might both be visited.

The Valleyfield Exhibition in the district of Beauharnois was the first fall fair attended from the Lennoxville Station in the fall of 1915, taking place August 17-20. A 35-foot space was allotted to the Station in the Industrial Building for the exhibit, which consisted of models of barns, piggeries, and poultry equipment, as well as grains, vegetables and flowers grown at the Lennoxville Station. One hundred and three names were secured for the mailing list.

The Stanstead County Fair was held at Ayer's Cliff from August 31 to September 3. The weather was all that could be desired during the three days on which the fair was in progress and large crowds of people attended. The space for the Station exhibit was situated in the main building, in such a position that all who entered the hall could not help coming in touch with it. The exhibit was 24 feet long, and consisted of models, of bee supplies, poultry and horticulture. There were also specimens of seed corn on the ear, grasses, cereals, flowers and vegetables from the Lennoxville Station. At this fair, 179 names for the mailing list were secured.

The Compton County Agricultural Society No. 2 held their annual fair at Scotstown, Que., located about 40 miles east of Sherbrooke on the main line to St. John. This being a county fair, the attendance obtained at larger shows could not be expected as this fair only draws from a small radius of a few townships. The management was able to devote 25 feet of space to the Station exhibit, which consisted of models of barns, sheep-feeding racks, silos, and other farm buildings, also vegetables, cereals, and flowers, representing the cultural work carried on at the Lennoxville Station.

Canada's Great Eastern Exhibition is the banner fair for the Eastern Townships, and was held at Sherbrooke, Quebec, during the week September 4 to 11. A booth was erected in the main building to contain the Station's exhibit, which occupied a space of 44 feet in length and was composed of models of farm buildings, poultry equipment, and suggestions for horticulturists and bee keepers. In addition to the above, good specimens of grasses, clovers, cereals and corn grown at the Experimental Station were shown. A full exhibit of flowers and vegetables made up the cultural part of the exhibit, and numerous mottoes were hung at various places alongside. The mailing list shows that 722 people, most of whom were farmers, left their names for publications.

The Richmond County Fair was held at Richmond under the direction of the Richmond County Agricultural Society, September 16-17. The space allotted for the Station's exhibit was in the new main building near the main entrance. The exhibit occupied 24 feet, which gave ample room for the models, mottoes, vegetables and flowers. This location in the building enabled everybody to be reached as they entered the building, and 137 people left their names for the mailing list. There was great demand for the circulars treating on all branches of the work.

The Wolf County Fair was held at Marbleton, September 22, under the direction of the Wolf County Agricultural Association, and was the smallest fair visited during the season. The exhibit was placed in the main building, and occupied a space of 24 feet. Models of farm buildings and farm equipment, poultry equipment and a quantity of vegetables and flowers, made up the exhibit. At this fair 73 names were added to the mailing list.

EXPERIMENTAL FARM, BRANDON, MAN.

W. C. McKILLICAN, B.S.A., SUPERINTENDENT.

EXHIBITION AND EXTENSION WORK.

Dominion Experimental Farms' exhibits were made at the following fourteen fairs held in Manitoba last season:—Neepawa, Carman, Roland, Morden, Hartney, Elgin, Carberry, Brandon, Souris, Virden, Oak Lake, Russell, MacGregor, Birtle.

Marked interest in the various features of the exhibit was shown at all points. The Superintendent and his assistants had frequent opportunities of discussing farm topics with visitors, a wide distribution of publications was made and considerable additions to the mailing lists were secured.

EXPERIMENTAL FARM FOR SASKATCHEWAN, INDIAN HEAD, SASK.

W. H. GIBSON, B.S.A., SUPERINTENDENT.

EXHIBITION AND EXTENSION WORK.

An exhibit from this Farm was shown in 1915 at the following points:—Regina, Swift Current, Wolseley and Whitewood.

These exhibitions were well attended, and numerous inquiries were made regarding the various branches of mixed farming.

SESSIONAL PAPER No. 16

EXPERIMENTAL STATION, ROSTHERN, SASK.

WM. A. MUNRO, B.A., B.S.A., SUPERINTENDENT.

EXHIBITION AND EXTENSION WORK.

During the early part of the year 1915, arrangements were made with the Division of Extension and Publicity whereby they supplied for this Station an elaborate exhibit displaying various phases of the work being carried on by the Experimental Farms in general and by this Station in particular, and illustrating the results of many of the more important experiments. The complete exhibit occupied a wall space of 50 feet by 6 feet and a table space of the same length and 3 to 4 feet wide.

Under the head of Animal Husbandry were models of stables, barn fixtures and convenient appliances. Associated with this were exhibits from the Division of Forage Plants illustrating by means of plants and charts the best varieties and methods of growing various fodder crops and the results of feeding tests.

The Field Husbandry Division illustrated by means of charts the best rotations and best methods of summer-fallow, stubble treatment and other phases of cultivation.

Under Cereals were illustrated in glass jars samples of the leading varieties of grains, with charts showing the relative yields. Sheaves of various grains grown at the Rosthern Station were also displayed.

The Poultry Division had a display of various models of hen-houses, colony houses, trap-nests and feed hoppers and charts illustrating rations.

In the Bee Division was a working hive of bees and models of hives, honey extractors, and other appliances.

The Horticultural Division, in addition to demonstrating many results of their work in the way of fruit, vegetables and flower cultivation, lent attractiveness to the whole exhibit by a display of preserved fruits, fresh fruits, and cut flowers.

The services of Mr. G. B. Bodman, third year student of the Agricultural College at Saskatoon were secured to take charge of the exhibit.

A large number of agricultural societies throughout the northern part of the province were written to with the view of making arrangements for the display of this exhibit for their summer and fall fairs, but owing to poor railway service in some districts and to lack of arrangement of the fairs in circuits, it was only possible to take the exhibit to a small number of places.

Many of the buildings at the Saskatoon exhibition were occupied by the soldiers in training and good accommodation could not be secured, as a consequence of which the exhibit did not meet with the appreciation that it had done in previous years. Nevertheless the visiting public spoke well of it and the managing directors expressed a wish for it to return the following year.

In Prince Albert a large part of the lower floor of the main hall was available for the Rosthern exhibit and crowds were in attendance all the time asking questions concerning every phase of farm work and expressing on all sides appreciation of the work being carried on by the Experimental Farms.

Two smaller exhibitions were visited namely, Radisson and Kinistino. The Agricultural Society at Radisson put up a special building for the Station exhibit and have requested that it return every year. Kinistino gave accommodation in the main hall and request another exhibit from the Station in 1916.

Wherever comment was made on the exhibit, it was favourable and this year with the experience gained from last year, with closer touch being kept with the Provincial Department, and with the arrangement of fairs into circuits, it is hoped to attend a larger number.

EXPERIMENTAL STATION FOR NORTHWESTERN SASKATCHEWAN, SCOTT, SASK.

M. J. TINLINE, B.S.A., ACTING SUPERINTENDENT.

EXHIBITION AND EXTENSION WORK.

The exhibit from this Station consisted of strong exhibits of forage plants and small fruits, a number of the most suitable varieties of cereals, both threshed and in the sheaf, photographs illustrating different lines of cultural work carried on at the Station, and a series of glass tubes filled with grain in proportion to the returns secured by using varying amounts of seed. Collections of hardy perennial cut flowers, fresh fruit, and garden peas in the pod when in season were forwarded daily to the exhibition.

The following summer fairs were visited: Macklin, July 27, Unity, July 28, Wilkie, July 29-30. Cut Knife, August 3, Luseland, August 5, North Battleford, August 9-11, and Lloydminster, August 19-20.

Macklin was the first fair at which the exhibit was staged. A tent was erected in the centre of the main part of the grounds, for its accommodation. The attendance was approximately 800, and numerous inquiries were made relative to the different branches of the Farms' work.

At Unity the Station was allotted the central space, facing the competitive cereal exhibits. The models of farm buildings and poultry equipment received much attention. Visitors at the exhibit numbered approximately 600.

A building was erected at the Wilkie fair to accommodate the Experimental Farms' exhibit, and the competitive cereal and forage crops, the Farms' exhibit occupying the central space. The glass tubes filled with grain, the display of cut flowers and the specimens of small fruits received much attention. Visitors here numbered about 700.

At Cut Knife the exhibit was set up in the Arts Building. The length of the building, and the arrangement of the other exhibits, permitted setting up the Farms' exhibit at full length. Approximately 600 people visited the exhibit at this point.

At Luseland, the exhibit was staged in a large tent, situated in the best possible position to attract attention. Of the 700 people visiting the exhibit at this point, about 90 per cent were farmers from the surrounding district.

The exhibit was staged in the Arts Building at North Battleford, taking up the whole of one end of the first floor, thus affording a splendid opportunity for visitors to see the display. Most of the visitors at this fair were from the city.

At the Lloydminster fair, the exhibit was placed in a building with the farm produce, etc., entered for competition. There was an attendance of about 800 at this Fair, 95 per cent of these being interested in grain growing and dairying.

EXPERIMENTAL STATION, LETHBRIDGE, ALTA.

W. H. FAIRFIELD, M.S., SUPERINTENDENT.

EXHIBITION AND EXTENSION WORK.

The Experimental Farms exhibit sent out in southern Alberta from the Lethbridge Experimental Station has been a great attraction at all fairs attended and a benefit to the farming community around. Owing to the fact that while many of the fairs were in progress the farmers were in the midst of harvesting the greatest crop the country has ever produced, the number of men who could spare time to visit the fairs was much smaller than it otherwise would have been.

Besides the exhibition material sent from Ottawa, the Lethbridge Station supplied the following material: (*a*) samples of bottled fruit and vegetables; (*b*) extracted Alberta honey; (*c*) ears of selected Squaw corn; (*d*) prepared sheaves of wheat, oats, and barley, samples of those varieties recommended by the Department for Southern Alberta; (*e*) field peas in the vine, one a vine pea and the other a grain pea; (*f*) bunches of alfalfa and clovers; (*g*) small sacks of threshed grain of recommended varieties; (*h*) samples of alfalfa seed. Wherever the season and railway connections permitted, fresh strawberries, currants, raspberries and apples were sent from the Lethbridge Station out upon the exhibit with suitable legends. The observation hive of bees was carried until late in the season when the weather became too dull and cold.

At the Calgary Exhibition, early in the season, interest centered very largely around the material from the Lethbridge Farm. This was due possibly to the fact that the material was selected with the idea of displaying some of the more striking and really useful crops which are unusual for this section but are found feasible, and set out on the exhibit with a view to overcoming the tendency for an old-fashioned display of bottled grains and sheaves arranged in the regular designs, etc.

During the season the exhibit attended a total of sixteen fairs and one convention and exhibit of soil products.

The following is an itinerary of the fairs attended and their dates:—

Calgary, June 20 to July 6.
Okotoks, July 13 to July 14.
Granum, August 4 to August 5.
Stavely, August 6.
Claresholm, August 12 to August 13.
Carmangay, August 17 to August 18.
Gleichen, August 19 to August 20.
Cardston, August 24 to August 25.
Magrath, August 27 to August 28.
Raymond, August 30 to September 1.
Cochrane, September 7 to September 8.
Warner, September 16 to September 17.
Taber, September 22 to September 23.
Pincher Creek, September 24 to September 25.
Grassy Lake, October 12.
Bow Island, October 21.
Western Canada Irrigation Convention at Bassano, November 23, 24, 25.

Owing to the very heavy rainfall the Okotoks fair was postponed a day but even then the weather was unsettled and the attendance light.

The Granum fair had very fine weather right through and a very large attendance resulted. The exhibit was set up in a marquee, but it served very well with thirty-eight feet of panelling and most of the material out. The secretary had made a note of the exhibit in his prize list and much of the interest displayed by the farmers and townspeople was due no doubt to this advertising.

As the Stavely fair came on the day following Granum and railroad connections were poor the exhibit was rather late in arriving, but by noon a good exhibit was in place. The directors had placed an addition to the exhibition building to give full 50 feet space for the exhibit and it was regrettable that there was not time to set up the whole exhibit. Nevertheless much good was accomplished here among the farmers, who displayed great interest and asked many questions.

Claresholm was another place where the fair was a big success. About the best exhibit of the whole season was in place here. The building was light and enabled one to use the full 30 feet of space with all overhead fixtures, a thing that is rarely possible with the low ceiled buildings found on most of Alberta's fair grounds.

The Dominion Entomologist sent Mr. Walsh, assistant to the local entomologist, here, with Riker mounts of cutworms, army worms and other pests and their parasites, etc., and a very instructing lecture was given on those subjects to very many who were greatly interested.

A painted sign was obtained and nailed up over the entrance to the building the second day and much less questioning was necessary about the position of the exhibit.

Carmangay held quite a good fair and a goodly number of people turned out. Mr. Walsh attended here also and the people were greatly interested in learning the remedies for insect pests.

Unfortunately Gleichen was visited with very wet weather on both fair days and a a poor attendance resulted. Hardly more than a hundred came out. However, a good exhibit was set up in hopes that the weather would clear.

The Cardston fair should have been a big success, but, being held right at the commencement of harvest, the farmers were all too busy to come in to town, and therefore there was a much smaller attendance than otherwise would have been the case.

Magrath fair was about the same, but more interest was taken in the fair and a few more turned out than at Cardston.

The Raymond fair was easily the best advertised and most progressive on the circuit except Calgary. Two excursions were run down from Lethbridge and the attendance was considerably over 3,500. The sports, bucking, roping, racing, etc., were so good that the people had little time to look at exhibits, but all came in to admire and much interest was displayed in the Experimental Farms Exhibit.

Cochrane fair was held on grounds some two miles from town and as there was no building up, the secretary quartered the exhibit in a hall in the town. This was hardly a success as most of the farmers had stock to attend to and returned to their farms as soon as the sports were over, and practically none came in during the evening except those who were living in town.

Warner fair was poorly attended because of the large amount of work waiting in the harvest fields. A few farmers were in for a hurried visit to the exhibit.

The Taber fair was very good and had a fine attendance. The secretary gave over a small building for the exhibit but it was rather out of the way of the crowd and some missed it. Here the cloth sign came in very handy as it was placed where it could be seen by all who entered the main building.

Pincher Creek fair had a good attendance considering the heavy condition of the roads in that district.

Grassy Lake fair was held but one day and was quite a success, with a good attendance of farmers. The people of this district certainly asked many questions and took away many bulletins.

The Bow Island Agricultural Society held their first fair this year but the attendance was large. The Editor of the local paper had published the previous week a write-up concerning the exhibit and much of the interest taken in it here was due no doubt to this publicity.

The Irrigation Convention at Bassano had an exhibition of soil products, and here the exhibit was set up for the last time. Much more material was sent from the Leth-

bridge Station, including bottled apples, plums, and other fruit, and this year's sheaf grains and grasses. Quite a number of farmers from the surrounding irrigation districts visited the hall.

The number of practical farmers of Southern Alberta who have seen the exhibit and talked on different matters with the attendant, would be somewhere in the neighbourhood of 4,500. The total attendance was about 11,500. The mailing lists were made as much of a feature as was possible. Some three hundred and fifty-eight names were sent in to Ottawa on the forms at different times during the season.

LETHBRIDGE.

EXPERIMENTAL STATION FOR CENTRAL ALBERTA, LACOMBE, ALTA.

G. H. HUTTON, B.S.A., SUPERINTENDENT.

EXHIBITION AND EXTENSION WORK.

This Station was represented by an exhibit at the following fairs and exhibitions during the season, the exhibit being viewed by approximately 24,000 visitors: Crossfield, Calgary, Swalwell, Daysland, Edmonton, Stony Plain, Red Deer, Lacombe, Wetaskiwin, Trochu, Tofield, Lloydminster, Kitscoty, Vermilion.

At the smaller fairs, particularly, the exhibit was one of the special attractions, and many of the farmers attending the exhibitions spent much of their time with the exhibit. The various models were a source of interest and no doubt of profit. The photographs illustrating some phases of the work of the Station were also of interest, while the noxious weeds shown were a source of information for many. At the larger exhibitions attended the exhibit was naturally visited by a large number of people, but apart from a lively interest in poultry and small fruits, the interest in the general exhibit was not so great as at the smaller fairs.

EXPERIMENTAL STATION FOR THE OKANAGAN VALLEY, SUMMERLAND, B.C.

R. H. HELMER, SUPERINTENDENT.

EXHIBITION AND EXTENSION WORK.

An exhibit from this Station was shown at Kamloops, Armstrong and Summerland.

Numerous inquiries were made with respect to the work of the Experimental Farms, and literature relative to the Farms' work was distributed.

EXPERIMENTAL STATION, INVERMERE, B.C.

G. E. PARHAM, SUPERINTENDENT.

EXHIBITION AND EXTENSION WORK.

Cranbrook, B.C.—This fair was held September 8. The Agricultural Society at Cranbrook have an excellent building and ample space was allotted for the Experimental Farms' exhibit, which was constantly surrounded by interested visitors.

Invermere, B.C.—The Invermere fair was held on the Experimental Station grounds. Special displays were made of the products of the Station, a butter-making contest was arranged and a demonstration of fowl trussing made.

Nelson, B.C.—This was practically a fruit fair, but great interest was shown in all features of the Farm exhibit, to which an excellent location was given.

Grand Forks, B.C.—This was a good fair in all lines and the Experimental Farms' display was well attended. Requests for information were numerous and many names were added to the mailing lists.

Burton City, B.C.—The fair at this point was a comparatively small one but the interest shown was equal to that at any of the larger exhibitions.

Nakusp, B.C.—A very attractive display was made possible by the excellent location given the Farms' exhibit, and much favourable comment was received from interested visitors.

Throughout the whole circuit, the models of farm buildings were a great attraction, and the demand for publications was good at all points.

SESSIONAL PAPER No. 16

EXPERIMENTAL FARM FOR BRITISH COLUMBIA, AGASSIZ, B.C.

P. H. MOORE, B.S.A., SUPERINTENDENT.

EXHIBITION AND EXTENSION WORK.

Five fairs were attended from this Farm, namely, at Vancouver, Agassiz, North Vancouver, Chilliwack and Mission.

Vancouver, the biggest fair in British Columbia, was held from August 13-21. Approximately 55,000 people attended, and of these 5,000 viewed the Experimental Farms' exhibit, 693 names being placed on the mailing list. Agricultural Hall, in Hastings Park, where the exhibit was placed, was filled largely with fruits, flowers and vegetables. Thousands of circulars on agricultural subjects were distributed.

Agassiz Fair was held by the Kent Agricultural Association on September 6, and approximately 300 people attended. The exhibits were very few, and the weather was not propitious. All present viewed the Dominion Experimental Farms' exhibit, which formed 90 per cent of the display, but only six names were added to the mailing list.

North Vancouver Fair, held by the North Vancouver Horticultural Association, September 10 to 11, was entirely of a horticultural nature. Very much interest was displayed in horticultural subjects. Approximately 400 people attended, and 45 names were placed on the mailing list. All visitors viewed the Farms' exhibit, and many inquiries were answered relating to the Farms' work.

Chilliwack Fair, held by the Chilliwack Agricultural Association, September 15-17, was the largest country fair in the province. The Dominion Experimental Farms' exhibit was well attended, and many questions were asked, showing that the farmers were looking for practical information. Approximately 800 people viewed the exhibit, and 32 names were placed on the mailing list.

Mission Fair, held by the Mission Agricultural Association, September 22-23, was attended by about 500 people, and 20 names were added to the mailing list.

EXPERIMENTAL STATION FOR VANCOUVER ISLAND, SIDNEY, B.C.

L. STEVENSON, B.S.A., M.S., SUPERINTENDENT.

EXHIBITION AND EXTENSION WORK.

The exhibition and publicity work undertaken by this Station during the past fiscal year was as follows:—

South Saanich Flower Show.—Here the Station's exhibit consisted of a display of cut flowers, flowering plants and potted shrubs. This work was made as instructive as possible.

Cameron-Nannose-Newcastle Agricultural Society Fair.—This was held on September 7, and a complete exhibit from the Station was set up, the equipment supplied from Ottawa being used, and supplemented with a full exhibit of grains, grasses, fruits, honey, bees, etc.

Salt Spring Island Agricultural Society Fair.—This fair was held at Ganges Harbour on September 22, and the Station exhibit was the same as that used at Hilliers on September 7.

North and South Saanich Agricultural Society Fair.—This fair was held at Saanichton, September 25-26, and at this exhibition the full equipment was used, and supplemented with an extensive floral display, and exhibits of fodder plants, grains, preserved fruits, etc.

At all these fairs, a large number of bulletins were distributed, and information given to those seeking it. Two men were on duty with the exhibit.

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